The Effects of Teacher Enthusiasm on Student Motivation, Selective Attention, and Text Memory

by

Andrea M. Wood

Department of Psychology

Submitted in partial fulfilment
of the requirements for the degree of
Doctorate of Philosophy

Faculty of Graduate Studies
The University of Western Ontario
London, Ontario
April 1998

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0-612-31111-2

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ABSTRACT

The purpose of the present study was to examine the cognitive and affective mechanisms underlying the effects of teacher enthusiasm. In order to determine why and how teacher enthusiasm facilitates learning, hypotheses about three alternative processes were tested, namely motivation, attention, and memory encoding. The present study was a laboratory experiment conducted in a "simulated" classroom using videotaped lectures. Three hundred introductory psychology students were randomly assigned to one of four treatment conditions, namely Low Enthusiasm, High Enthusiasm/Strategic, High Enthusiasm/Random, and High Enthusiasm/ Uniform. The Low Enthusiasm condition contained few if any enthusiastic teaching behaviors. The High Enthusiasm/Strategic condition contained high levels of enthusiastic teaching behaviors, and these low-inference behaviors were coordinated with the topic structure of the lesson. The High Enthusiasm/Random condition also included frequent use of enthusiastic behaviors, but these behaviors sometimes did and sometimes did not coincide with the topic structure of the lesson. The High Enthusiasm/Uniform condition featured frequent use of enthusiastic teaching behaviors, but their occurrence remained constant at all points throughout the lecture.

The motivation model of teacher enthusiasm predicted that student learning and motivation for further learning, as measured by (1) a questionnaire

and (2) student demand for further reading on the lecture topic, would be higher in all three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than in the Low Enthusiasm condition. The attention model of teacher enthusiasm predicted that student learning and attention, as measured by (1) secondary task reaction time and (2) on-task behavior would be higher in the three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than in the Low Enthusiasm condition. The memory model predicted that student learning and memory encoding as measured by (1) overall recall, (2) topic access, (3) conditional recall, and (4) topic representation would be higher in the High Enthusiasm/Strategic condition than in the other three conditions (i.e., High Enthusiasm/Random, High Enthusiasm/Uniform, Low Enthusiasm).

MANOVA analyses and multiple comparison tests suggested that teacher enthusiasm produces significant effects on student motivation, student attention, and student memory encoding, as predicted by motivation, attention, memory models. The text memory model seemed to do a better job of accounting for the overall pattern of results obtained in this research than either the attention or motivation models. For one thing, only the memory model is able to account for the fact that student learning, as measured by the multiple-choice test, was significantly facilitated only when teacher enthusiasm was used strategically to emphasize important points in the lecture. Both the attention and motivation

models predict, incorrectly, that student learning should have been facilitated by all three High Enthusiasm conditions. A second finding favoring the text memory model over the attention and motivation models is that in the multiple regression analyses, text memory was the only variable found to significantly mediate the relationship between teacher enthusiasm and student learning. The results of the study suggest that high levels of teacher enthusiasm are not enough to guarantee learning. In order to have a significant affect on learning, enthusiastic teaching behaviors must be strategic and coincide with the topic structure of a lecture. This research has important implications for the instructional development of university professors.

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INTRODUCTION

The main goal of teacher effectiveness research is to identify the types of instructional activities that produce educational changes in students (Murray, 1991). Teacher effectiveness research examines the relationship between teacher characteristics (e.g., clarity, enthusiasm) and various student outcome measures (e.g., learning, motivation). Identifying the characteristics which differentiate effective from ineffective teachers has important implications for the instructional development of teachers. For example, in-service programs could focus on instructional activities known to contribute to student learning (Murray & Lawrence, 1980). Instructors could also receive diagnostic feedback regarding their use of effective teaching behaviors (Murray, 1983b)

Teacher enthusiasm is one of many teacher characteristics studied in teacher effectiveness research. Murray (1983a) defined teacher enthusiasm as consisting of the following expressive teaching behaviors: (1) speaking in a dramatic or expressive way, (2) variation in pitch and volume, (3) vocal inflection, (4) smiling or laughing while teaching, (5) moving about while lecturing, (6) gesturing with hands or arms, (7) exhibiting facial gestures or expressions, (8) eye contact, and (9) humour. Extensive research has consistently shown an association between enthusiastic teaching and student learning (e.g., Murray, 1983a, 1983b, 1985; Perry & Magnusson, 1987, 1989). However, few studies have directly examined the cognitive processes

that mediate between teacher enthusiasm and student achievement. The goal of the present research is to determine the cognitive mechanisms underlying the effects of teacher enthusiasm.

Teacher Effectiveness Research

Two distinct research approaches have been employed in teacher effectiveness research in higher education: observational and experimental. The main goal of observational research is to investigate teacher characteristics as they naturally occur in relationship to other variables, such as student learning. For example, teacher characteristics such as clarity and enthusiasm have been found to be correlated with student exam performance and student ratings of instruction. Data are collected in a naturalistic setting, and consequently results are generalizable to actual classrooms. It is important to note that although this approach can determine relationships between teacher characteristics and student outcomes, it cannot confirm causation or eliminate alternative causes of student learning. The second approach to teacher effectiveness research, experimentation, attempts to overcome the deficiencies of observational research by systematically manipulating one or more variables with all other variables controlled, and measuring the effects of this manipulation on student outcome variables.

Two distinct types of teacher characteristics have been studied in teacher

effectiveness research: high-inference and low-inference. High-inference teacher characteristics include general, abstract traits such as "clarity" and "enthusiasm", while low-inference teacher characteristics refer to specific, concrete behaviors such as "addresses individual students by name" and "gives several examples of each concept". According to Murray (1983a, 1983b, 1991), understanding teaching effectiveness in terms of specific, "low-inference" classroom behaviours has definite advantages. High-inference teacher characteristics such as clarity, rapport, and enthusiasm are too global and abstract to be of practical value, and require too much inference or subjective judgement on the part of an observer. Low-inference teaching behaviours, on the other hand, are more specific and denotable, and require minimal inference by the observer (Rosenshine & Furst, 1971). Also, low-inference teaching behaviours are easy to operationalize and manipulate in experimental research (Murray, 1991), and are of greater practical or applied value because instructors can more readily alter specific behaviours such as level of eye contact, vocal variation, and movement. Furthermore, researchers are more likely to use consistent operational definitions of teaching when they are based on specific, concrete behaviours as opposed to global, abstract concepts. This consistency in operational definitions facilitates the comparison of research results across studies.

In the past decade, high-inference rating systems have varied from two categories of teacher characteristics (e.g., Cohen, 1981) to 27 categories

Feldman, 1989). However, expanding the number of categories does not resolve the deficiencies of high-inference approaches, it simply increases the number of subjective evaluations required by student raters.

Considering the strengths of low-inference measurement techniques, the following review of the research literature on teacher effectiveness focuses solely on investigations employing low-inference data collection. Of particular interest is the relationship between enthusiastic teaching behaviours and student outcome variables.

Observational Studies

As noted above, the goal of observational teacher effectiveness research is to identify teacher behaviours that are associated with student outcomes. Solomon, Rosenburg, and Bezdek (1964) conducted the first major observational study of low-inference behaviours in university teaching. The sample included 24 political science instructors teaching lecture-style classes ranging in size from 11 to 38 students. Teaching behaviours were identified by student descriptive questionnaires, instructor self-report questionnaires, audiotape recordings, and reports by outside observers. Teaching effectiveness was measured through student instructional ratings and objective indicators of student factual and comprehension learning. Factor analysis of 169 low-inference teaching behaviors identified 8 significant factors. Factor 4 (clarity) correlated significantly with both learning (factual) and student evaluation of teaching, whereas Factor 2 (energy) and Factor 6 (flamboyance) correlated

significantly with learning (comprehension). Finally, Factor 8 (warmth) correlated significantly with student evaluation of teaching.

Solomon (1966) replicated the above results using a larger sample and less complicated measurement techniques. The sample included 229 instructors of small evening classes from 5 different universities. Teaching behaviours were assessed by an instrument that included 69 descriptive items. Factor analysis of the 69 items identified 10 significant factors. Student instructional ratings correlated significantly with 2 of the 10 factors: encouragement of participation and energy.

These investigations demonstrate significant relationships between factors comprised of specific, low-inference teaching behaviours and student outcome variables. Enthusiasm (or energy) was significantly related to perceived teaching effectiveness in both studies.

Murray (1983a) attempted to overcome methodological limitations of previous observational studies of low-inference teaching behaviours. The 54 participating instructors were assigned to low-, medium-, and high-rated teaching effectiveness groups on the basis of archival student ratings from previous courses. Outside observers used the Teacher Behaviors Inventory (TBI), a 60-item behavioral rating form, to record low-inference classroom teaching behaviors of low-, medium-, and high-rated instructors. Teaching behaviors were observed in three separate 1-hour lecture classes by 6 to 8 trained observers per instructor. After 3 hours of

observation, each observer rated the frequency of occurrence of each of the 60 low-inference TBI behaviors on a 5-point scale.

It was found that low-, medium-, and high-rated groups differed significantly on 26 of the 60 low-inference teaching behaviors included in the TBI. Group differences in mean factor scores were significant for clarity, enthusiasm, and rapport factors. Group differences were largest for enthusiastic teaching behaviors such as speaks expressively, shows strong interest in the subject, moves about while lecturing, uses humour, and shows facial expressions.

Additional research on lecture-style teaching by Murray (1985) used a 100-item version of the Teacher Behaviors Inventory (TBI) and replicated the results of the earlier study. Correlations between classroom teaching behaviors and perceived teaching effectiveness were strongest for enthusiastic teaching behaviours (e.g., shows facial expressions, moves about while lecturing). Similar findings were found in research conducted by Mintzes (1979), and Erdle and Murray (1986).

The majority of observational studies of low-inference teaching behaviors have used student ratings as the sole measure of teaching effectiveness. Murray (1983b) extended previous research by including student learning and student motivation as additional measures of teaching effectiveness. The sample included 36 instructors who had taught class sections of a multi-section introductory psychology course between 1975 and 1979. The multi-section course included approximately

2500 students randomly assigned to 10 and 15 class sections per year. Each class section used the same textbook, wrote the same exam, and completed the same teacher and course evaluation forms, thus making it possible to directly compare teachers in terms of various criteria of teaching effectiveness, and to relate differences in effectiveness to differences in classroom behavior.

The low-inference teaching behaviours of the 36 instructors were recorded by 6 trained observers using a 100-item version of the Teacher Behaviors Inventory (TBI). Measures of teaching effectiveness included two measures of student satisfaction (course rating, instructor rating), two measures of student motivation (amount of studying, registration in senior psychology courses), and two measures of student learning (exam performance, perceived learning). One-way analyses of variance indicated that instructors differed significantly on each of the six criterion measures, and Pearson correlations computed between teaching behavior factor scores and measures of teaching effectiveness yielded a number of significant results. For example, enthusiastic teaching behaviors (e.g., speaks expressively, gestures with hands or arms) correlated significantly with 4 of the 6 measures of teaching effectiveness, including teacher rating ($r=.72$), course rating ($r=.57$), senior course registration ($r=.45$), and final exam performance ($r=.36$), thus demonstrating the wide-ranging influence of teacher enthusiasm.

This review of observational research demonstrates a strong association

between enthusiastic teaching behaviors and various outcome measures of teaching effectiveness. Instructors who "speak expressively", "gesture with hands and arms", and "move about while lecturing" tend to receive higher ratings of teaching effectiveness and to produce higher levels of student motivation and student learning than instructors who"speak in monotone" and "read lecture verbatim from prepared notes".

Experimental Studies

Observational investigations have established a significant correlation between teacher enthusiasm and student learning. Experimental research builds upon observational data by attempting to confirm a causal link between teacher enthusiasm and student outcomes. Two approaches to experimental research have been used in teacher effectiveness research: field experiments and laboratory experiments. Each approach has its own strengths and weaknesses. In field experiments, teacher enthusiasm is manipulated in actual classrooms, so that research results are generalizable to natural classroom settings. In contrast, laboratory experiments are conducted in an artificial setting where variables are more easily controlled and alternative explanations of research results more easily ruled out (e.g., introductory psychology students watching a videotaped lecture).

Field Experiments. One of the first field experiments on teacher enthusiasm was conducted by Coats and Smidchens (1966). Subjects included 184 students

enrolled in eight introductory speech classes at The University of Michigan. Two instructors, graduate students in education, each presented 10 minute lectures that were identical in content, but not in delivery, to four different classes. Each instructor taught two of four classes in a dynamic or enthusiastic fashion (e.g., lecture delivered from memory using vocal variation, eye contact, and animation) and the remaining two classes in a static, nonenthusiastic manner (e.g., entire lecture read from notes in monotone). Consistent with expectation, instructor dynamism was found to improve student recall of lecture material. Students in the dynamic lecture condition recalled significantly more information from the lecture than students in the static condition.

Wyckoff (1973) advanced earlier research by incorporating teacher enthusiasm training sessions into the research design, and including two distinct groups of students (e.g., elementary and secondary). Subjects included 24 elementary and 24 secondary school students ranging in age from 9 to 17 years. Twelve instructors were randomly selected from 90 student teachers attending the Microteaching Clinic at the University of Massachusetts. All 12 instructors received training in: (1) gesturing, (2) pausing while lecturing, and (3) movement around the classroom. Students and instructors were randomly assigned to teaching stations of four students each, with six classes of elementary students and six classes of secondary students. Each instructor taught two distinct lecture topics, with one

lecture presented with enthusiasm (e.g., movement, vocal variation), the other with minimal stimulus variation (e.g., teacher sitting at a desk, notes read verbatim). Lectures were videotaped and analysed for change in teacher behavior (e.g., vocal variation, movement). Students also completed a 12-item written test following each lecture.

Observational analysis of videotapes indicated increased teacher movement, vocal variation, and animation during "treatment" lectures. However, despite increased levels of teacher enthusiasm, stimulus variation was found to improve learning only in older students. Secondary school students retained more information when instructors were animated, whereas elementary students performed more poorly under these conditions. One possible explanation for this finding was that younger students were distracted by enthusiastic teaching behaviors. Research by McKinney, Larkins, Kazelskis, Ford, Allen, and Davis (1983) supports the "distraction" hypothesis. Grade 4 students were randomly assigned to high, medium, and low enthusiastic teaching conditions. Increased classroom management problems were reported only in high enthusiasm conditions. Similar findings were reported in McKinney and Larkins (1984) in a study of Grade 1 students.

Murray and Lawrence (1980) demonstrated the effectiveness of a teacher enthusiasm training program for university lecturers. It was hypothesized that speech and drama training would improve university teaching effectiveness since many of

the communication techniques used by actors (e.g., voice projection and variation, movement and gesture) have been found to differentiate between effective and ineffective teachers. The study used a nonequivalent control group design, in which 12 volunteer participants in a speech and drama workshop were compared to 12 matched controls with comparable pre-treatment ratings of teaching effectiveness. Experimental instructors attended 20 two-hour workshops in which they were taught how to apply acting techniques (e.g., body movement, expressive speech) to classroom teaching. Teaching effectiveness was assessed by a 42-item student rating form completed at the beginning (pretest) and end (posttest) of the 20-week training program. Independence of pretest and posttest ratings was ensured by using different random samples of 15 student raters at pretest and posttest.

Consistent with expectation, significant improvements in teaching effectiveness were found for instructors who had participated in training sessions. More specifically, experimental teachers significantly improved their mean overall effectiveness ratings from pretest to posttest, whereas control teachers did not. In addition, significant improvements in specific teaching behaviors were found for experimental teachers. Following the intervention, trained teachers were more likely than controls to exhibit classroom teaching behaviors such as the following: (1) shows concern for student progress, (2) friendly and approachable, (3) shows facial expressions, (4) asks questions, (5) suggests supplementary reading, and (6) lectures

without notes.

Murray and Lawrence's (1980) study was a significant contribution to teacher effectiveness research in that enthusiasm training was found to generalize to the classroom and to produce significant improvement in teacher effectiveness ratings and specific teaching behaviors. Also, the researchers believed they were justified in the use of student ratings as an outcome measure, since past research had supported the construct validity of student ratings as a measure of teaching effectiveness. Nonetheless, future studies should include additional measures of teaching effectiveness such as exam performance and student motivation for further learning.

Other experimental studies have demonstrated beneficial effects of teacher enthusiasm training on student attitudes, attention, and learning. For example, Streeter (1986) found that enthusiasm training increased the occurrence of enthusiastic teaching behaviors in the classroom and improved students' attitudes toward reading. A number of researchers have also found that teacher enthusiasm improved student attention and "on-task" behaviors in the classroom (e.g., Bettencourt, Gillett, Gall, & Hull, 1983; Burts, McKinney, & Burts, 1985; Brigham, Scruggs, & Mastropieri, 1992).

Laboratory Experiments. The next section of this review focuses on experimental studies that were conducted in "simulated" classrooms using videotaped lectures. As mentioned earlier, laboratory experiments minimize threats to internal

validity by manipulating only targeted variables and keeping conditions constant (e.g., different delivery method but same instructor and lecture material).

One of the first laboratory experiments on teacher enthusiasm was conducted by Ware and Williams (1975). This study included experimental manipulation of both teacher enthusiasm or "seductiveness" (high, low) and content coverage (high, medium, low). Based on an earlier study by Naftulin, Ware, & Donnelly (1973), the researchers expected students to be "seduced" into giving higher ratings to enthusiastic teachers, regardless of content coverage and amount learned. Subjects included 206 undergraduate and graduate students equally divided into six groups. Each group watched one of six versions of a 20 minute videotaped lecture on the biochemistry of memory. "Dr. Fox", a professional actor, constructed videotaped lectures that were either high, medium, or low in information coverage (i.e., either 26, 14, or 4 topics covered) and were delivered either in an enthusiastic manner or with minimal enthusiasm. Ware and Williams did not give a detailed description of the high enthusiasm condition, except that it incorporated the following lecturer characteristics: enthusiasm, humor, friendliness, expressiveness, charisma, and personality. Outcome variables included a 26-item multiple choice exam and an 18-item student rating questionnaire measuring perceived effectiveness, student interest, and perceived learning.

Both instructor enthusiasm and content coverage had an impact on exam

performance and on student ratings. Exam performance and student ratings were higher for "enthusiastic" lectures than for control lectures, and higher for lectures with high content coverage than for medium and low content coverage. Consistent with expectation, low content coverage reduced student ratings and exam performance in the low enthusiasm condition only. Based on this last finding, the authors challenged the validity of student ratings. They asserted that students can be "seduced" into giving high ratings, even when content coverage is low. Despite this finding, instructor enthusiasm contributed to both student learning and instructional ratings, and therefore was once again shown to be a significant factor in classroom teaching.

Researchers followed up the original Ware and Williams study with a series of "Dr. Fox" experiments (e.g., Perry, Abrami and Leventhal, 1979; Williams & Ware, 1976; 1977). These were summarized by Abrami, Leventhal, and Perry (1982) in a meta-analysis of 10 studies from two bodies of research. Instructor enthusiasm was generally found to contribute more than content coverage to student ratings, accounting for 28.5% of the variance in student ratings, while content coverage accounted for only 4.6%. This pattern of findings was reversed for achievement outcomes, with teacher enthusiasm accounting for 4.3% of the variance in student learning and content coverage accounting for 15.8%. It is important to note the wide range in effect sizes across research. Effect sizes for expressiveness ranged from 8.8% to 54.1% for ratings, and from 0.0% to 10.5% for achievement. Effect sizes for

content coverage ranged from 0.0% to 21.5% for ratings and from 0.4% to 30.2% for achievement. Effect sizes for enthusiasm were generally more conservative in research conducted by the Williams and Ware group than in research conducted by Perry and his Manitoba associates. This discrepancy may be explained by William and Ware's more global or high-inference definition of enthusiasm (e.g., humour, friendliness, expressiveness, charisma, personality), compared to Perry's explicit manipulation of low-inference enthusiastic behaviors (e.g., eye contact, physical movement, voice inflection). It is possible that a manipulation check of William and Ware's videotapes might reveal relatively little difference between the classroom behaviors of "enthusiastic" and "control" instructors.

Several more recent investigations have adopted the "Dr. Fox" research design involving manipulation of low-inference teaching behaviors in videotaped lectures. Anderson and Withrow (1981) presented videotaped lectures of varying enthusiasm (high, medium, low) to college students enrolled in a speech communication class. Enthusiastic teaching behaviors had a significant impact on student ratings of instructional effectiveness (mean variance accounted for=22%), but no significant effects of teacher enthusiasm were found for student learning. A manipulation check using the Behavior Indicants of Immediacy Scale confirmed varying levels of instructor enthusiasm across conditions. It is important to note that teacher enthusiasm was defined in general terms such as warmth, immediacy, and

inclusivity. Perhaps the affective components of teacher enthusiasm influence student ratings more than they influence student learning.

Perry and his colleagues (e.g., Perry & Dickens, 1987; Perry & Magnusson, 1987; 1989; Perry & Penner, 1990; Schonwetter, Perry, & Struthers, 1994) have made the most recent contributions to laboratory experimentation on teacher enthusiasm. Perry advanced existing research by identifying an interaction effect between instructor behaviors and student characteristics (e.g., perceived control). Consistent with earlier research, enthusiastic instruction yielded generally higher achievement outcomes than unenthusiastic instruction. However, this relationship was found to be contingent upon a third variable: perceived control. Manipulating perceived control (e.g., mastery vs. helplessness) was found to either impede or enhance the achievement enhancing effects of teacher enthusiasm. Specifically, students were found to benefit from effective instruction only when they felt a sense of control over learning outcomes.

The preceding laboratory studies have demonstrated the general effects of teacher enthusiasm on student learning and student ratings of teacher quality. Additional laboratory studies have tested the specific effects of various behavioral components of teacher enthusiasm, including (1) eye contact, (2) humor, (3) voice intonation, and (4) body movement/gestures. Examining the unique effects of each component of teacher enthusiasm is an important step towards understanding its

underlying mechanisms.

Eye contact, also referred to as gazing behavior, has been examined by Kelley and Gorham (1988), Sherwood (1987), Burgoon, Coker, & Coker (1986), Hamlet, Axelrod, & Kuerschner (1984), and Otteson & Otteson (1979). Teacher gaze has been found to facilitate recall in both elementary (Otteson et al, 1979) and college students (Sherwood, 1987). In both studies, student recall of course content was superior in "gaze" conditions, where instructors directed eye contact at students, compared to "no gaze" conditions. Several explanations were proposed for these findings, including "extra attentiveness"and "an increased sense of personal relationship" (Sherwood, 1987, p.1278). It is important to note that no direct tests of these latter hypotheses were conducted.

Eye contact has also been found to improve student compliance and classroom management (e.g., Hamlet, Axelrod, & Kuerschner, 1984; Otteson & Otteson, 1979). Hamlet, Axelrod, and Kuerschner (1984) examined the effects of eye contact on the behavior of noncompliant students. Student compliance was compared in two conditions: demanded eye contact and no eye contact. Consistent with expectation, students followed instructions more frequently when they were asked to look at their teacher compared to when no eye contact was demanded. One possible explanation for this finding is the "extra attentiveness" hypothesis proposed by earlier researchers (e.g., Sherwood, 1987). Demanding eye contact may have encouraged

students to pay attention to their teachers, which in turn would enable them to follow instructions.

The effects of humour on student learning has been studied extensively (e.g., Johnson, 1990; Kaplan & Pascoe, 1977; Schmidt, 1994; Zillmann, Williams, Bryant, Boynton, & Wolf, 1980; Ziv, 1988). Kaplan & Pascoe (1977) uncovered one of the most important findings on humour and student learning: in order for humour to facilitate learning, it must be related to the topic of discussion. Students in the Kaplan & Pascoe study watched one of four versions of a 20-minute videotaped lecture on Freudian personality theory (concept humour, nonconcept humour, mixed humour, and no humour). Overall performance on a recall test did not differ among the four groups, however, recall of specific items varied significantly. More specifically, students in the concept humour condition (e.g., humour related to the topic) recalled significantly more of the humour items compared to nonhumour items. In contrast, recall of humourous and nonhumourous items was not significantly different for the other three groups. Consequently, although humour did not improve overall comprehension of a lecture, it did improve recall of test items based on humourous examples. The researchers proposed that "humourous examples may have served as cues for recalling information" (p. 64). Selective attention may also explain these findings. Superior recall of humourous items in the concept humour condition may have been due to increased attention to humourous items at the

expense of nonhumourous items.

The selective attention effects of humour were specifically examined in a study by Schmidt (1994). Schmidt proposed that humourous material is "distinct" and "incongruous" from nonhumourous material, and therefore receives extra attention during encoding. This hypothesis was tested by comparing memory for humourous and nonhumourous versions of sentences. Memory for humourous sentences was superior to memory for nonhumourous material only when humourous sentences were interspersed with nonhumourous sentences. This finding supports the "distinctiveness" hypothesis where humourous material stands apart from nonhumourous material. This study has important implications for using humour in the classroom. Consistent with Kaplan & Pascoe's (1977) findings, enhanced recall of humourous material occurred at the expense of nonhumourous material. Therefore, it is important to use humour only in relation to important course material. Secondly, recall of humourous material only enhanced recall when it was presented in conjunction with nonhumourous material. Similar findings were reported by Ziv (1988) who found the "optimal dose" of humour to be three to four jokes per lecture.

Slater (1981) was one of the few researchers to isolate the effects of vocal variation, as a component of teacher enthusiasm, upon student learning. Slater compared the effects of vocal and nonvocal enthusiasm on student recall of videotaped lectures. Vocal enthusiasm was defined as variation in pitch and volume,

vocal inflection, and pausing for stress of important points. Nonvocal enthusiasm was defined as body movement and gesture, hand and arm gesture, facial expression, and eye contact. Subjects watched one of four videotaped lectures involving: (1) neither vocal nor nonvocal enthusiasm, (2) high nonvocal and low vocal enthusiasm, (3) low nonvocal and high vocal enthusiasm, and (4) high nonvocal and high vocal enthusiasm. It was found that students in the high nonvocal condition gave higher instructional ratings, on average, and were more likely to request further reading than students in the high vocal enthusiasm condition. However, the two groups did not differ significantly on achievement tests. These findings reveal the possible differential impact of vocal and nonvocal enthusiasm on student outcome measures. Additional research needs to be conducted to substantiate and extend the above findings.

Consistent with Slater (1981), teacher movement has been found in other experiments to improve student learning. VanderMars, Darst, Vogler, & Cusiman, (1994) examined the relationship between teacher movement and student involvement in the learning task. Students were more likely to be on-task and involved in the learning task when their teachers moved around the room than when teachers remained in one location. Similar results were reported by Kelley & Gorham (1988), who found that instructor immediacy (e.g., reduction in physical distance, forward leans) accounted for 11.4% of the variance in student recall of lecture material.

The saying "out of sight, out of mind" may help explain why students learn more from teachers who move around the room. Teachers who remain in one place will only come in contact with students at the front of the room, whereas teachers who move around the classroom will encounter a greater percentage of students. Students may be more likely to listen to a lecturer who is right in front of them compared to a lecturer who remains at a distance. The theoretical rationale used by Murray (1991) to explain the achievement enhancing effects of teacher enthusiasm may also explain the above findings. According to Murray (1991) "if a stimulus is unchanging and predictable, we tend to stop paying attention to it" (p. 148). Therefore, students may be less likely to "tune out" instructors who move about the room because they are "dynamic and spontaneous rather than unchanging and predictable" (p. 148).

Theories of Teacher Enthusiasm

As reviewed, extensive research has supported the facilitative effects of enthusiastic teaching behaviors on student learning. However, few studies have examined the psychological mechanisms or processes underlying the effects of teacher enthusiasm. Why or how do enthusiastic teaching behaviors facilitate learning? What cognitive and affective processes do enthusiastic teachers generate in their students? There are many possible mechanisms by which teacher enthusiasm could facilitate student learning. Two distinct hypotheses have been presented by past

researchers, namely motivation for further learning and selective attention. A review of these two existing theories will be followed by a novel explanation for the achievement-enhancing effects of teacher enthusiasm. The third hypothesis proposes that enthusiastic behaviors facilitate learning because they emphasize the structure of the lesson, which in turn, aids the encoding and retrieval of text.

Motivation for Further Learning

It has been suggested that teacher enthusiasm facilitates achievement because it increases motivation for learning both inside and outside the classroom. Research has supported the motivational effects of teacher enthusiasm. Murray (1983b) examined the relationship between low-inference teaching behaviors and student motivation (as well as student learning and student instructional ratings) in a multi-section introductory psychology course. Student motivation was measured by amount of studying and by the frequency of senior course registration. A significant positive correlation was found between teacher enthusiasm and senior course registration. That is, students taught by highly enthusiastic introductory psychology instructors were more likely to register in senior psychology courses than students of less enthusiastic teachers.

Bettencourt, Gillet, Gall, and Hull (1983) carried out research designed to examine the effects of teacher enthusiasm on student attention, with attention defined as student engagement in teacher-led instruction. The results supported the

hypotheses, in that student engagement in the lecture was significantly higher for enthusiastic classes than for control classes. A second, unexpected finding was also reported. Not only did teacher enthusiasm augment attention to teacher-led instruction, it also produced higher levels of student motivation, as indicated by improved involvement in seatwork. Students of enthusiastic teachers were significantly more likely to be on-task during seatwork than students of control teachers. The positive effects of teacher enthusiasm seemed to generalize beyond attention within the classroom. Similar results were reported in Perry and Penner's (1990) study of teacher enthusiasm. Undergraduate students who had watched videotaped lectures of enthusiastic teachers performed significantly better on an out-of-class homework assignment than students who had watched unenthusiastic teachers.

Slater's (1981) findings also support the motivational theory of teacher enthusiasm. In this study, undergraduate students watched one of four videotaped lectures involving either: (1) low nonvocal and low vocal enthusiasm, (2) high nonvocal and low vocal enthusiasm, (3) low nonvocal and high vocal enthusiasm, and (4) high nonvocal and high vocal enthusiasm. Following the lecture, subjects first completed an instructor rating form and multiple-choice and essay exams based on the lecture, then were told that if they were interested in the topic of the videotaped lecture, they should fill out an "order form" requesting that further reading on the

topic be sent to them by mail. Subjects in the two high nonvocal enthusiasm conditions were significantly more likely to request further reading than subjects in the other two conditions. It is interesting to note that none of the subjects in the high vocal/low nonvocal condition requested further reading, while only two requests came from the low vocal/low nonvocal enthusiasm. This result suggests that nonvocal behavior (e.g., movement & gesture) may influence student motivation more than vocal behaviors (e.g., voice intonation).

Streeter (1986) examined the effects of teacher enthusiasm training on student attitudes toward reading in Grades 1-5. Nineteen teachers were randomly assigned to a training group (N=10) and a control group (N=9). Observational ratings supported significant increases in enthusiastic teaching behaviors by the experimental group following the two week training period. Students completed a reading attitude survey (SRA) before and after the intervention. The survey measured three factors: expressed reading difficulty (ERD), reading as a direct reinforcement (RDR), and reading enjoyment (RE). Consistent with expectation, attitudes of students in control classes were found not to change, whereas a significant improvement was found in attitudes of experimental subjects toward reading. Students in the enthusiasm classes "perceived themselves as having less difficulty with reading and experienced less unpleasant physical sensations or feelings when involved in reading" (p. 257).

The change in attitude exhibited by Streeter's (1986) subjects may explain

why enthusiastic teachers motivate students. Students often look to teachers for guidance and feedback. A teacher's smile, gaze, nod of the head, and movement about the room may serve to reinforce student engagement in the lecture. As Sherwood (1987) noted, eye contact may generate "an increased sense of personal relationship" between teachers and students (p. 1278). This sense of personal relationship may encourage students to work harder. Streeter's (1986) subjects may have "experienced less unpleasant physical sensations and feelings" when their teachers were more animated because their attempts at reading were no longer being ignored by their teachers. In contrast, teachers who sit at the front of the room, and read from prepared notes are less likely to cultivate a bond with their students. Under these circumstances, students may stop working because their learning attempts are never recognized or reinforced by their teachers.

Murray (1991) proposed another possible explanation for the effects of teacher enthusiasm on student motivation, namely that students "model or imitate the energy and commitment of an enthusiastic instructor, thereby increasing their own motivation for study outside the classroom" (p. 159).

Selective Attention

A second explanation for the effects of enthusiastic teaching behaviors on student learning is that such behaviors serve an attention-getting role in the classroom. Murray (1991) proposed that "if a stimulus is unchanging and predictable, we tend to

stop paying attention to it" (p. 148). According to this view, students are more likely to attend to teachers who "speak expressively or emphatically", "show facial expressions", and "make eye contact" because these behaviors involve elements of stimulus variation and spontaneity. Since the lecture format of enthusiastic teachers is more dynamic and less monotonous than the lecture format of unenthusiastic teachers, students are less likely to "tune-out" expressive teachers.

In addition to its direct effects on student attention, Murray (1983a) suggested that teacher enthusiasm affects student learning indirectly in that it is a prerequisite for the effectiveness of other types of teaching behaviors such as clarity and organization. For example, teaching behaviors aimed at clarifying concepts and principles (e.g., repeats difficult ideas, uses concrete examples) will not improve learning unless students are "on-task" and actively engaged in the lecture.

A similar model of selective attention has been proposed by Perry and his associates (Perry & Magnusson, 1987; Perry & Penner, 1990). Selective attention refers to "a person's allocation of cognitive resources to the task at hand" (Glover, Ronning, & Bruning, 1990, p. 51). In order for students to learn new material, they must focus their attention on relevant information (e.g., teacher, textbook) rather than on outside distractions. Perry and his associates proposed that certain components of teacher enthusiasm, such as physical movement and voice intonation facilitate the process of selective attention. Teacher enthusiasm communicates to students that the

lesson is important and should be attended to. Consequently, students process the lesson rather than extraneous stimuli, which in turn improves memory storage and retrieval of new material (Perry & Dickens, 1987).

This hypothesis was not tested directly by Perry and his colleagues but was used to explain the moderating effects of perceived control on the relationship between teacher enthusiasm and achievement. It was found that expressive teaching behaviors facilitated learning under certain conditions of perceived control but not under control conditions where students experienced a loss of control over learning outcomes (Perry, 1990; Perry & Dickens, 1984; 1988). How does loss of control affect selective attention? Perry (1991) hypothesized that loss of control impairs information-processing activities (e.g., selective attention) normally activated by effective instruction. According to learned helplessness theory, individuals who experience loss of control perceive little connection between actions and desired results. These feelings of "helplessness" produce severe cognitive, motivational, and emotional deficits. Perry (1991) proposed that "expressive instruction would have little effect on selective attention if it were diverted to repetitive thinking or rumination such as I can't, I'm a failure" (p. 29). In addition, if a student believed that failure was inevitable, then s/he would not be motivated to attend to the lecture. In summary, "attention would be either consumed with repetitive cognitions, or incapacitated by demotivating cognitions"(Perry, 1991, p. 29).

Perry and his associates proposed that enthusiastic teaching behaviors facilitate learning because they encourage students to pay attention to the lecture. However, it is difficult to draw any conclusions regarding selective attention from their research since they used this hypothesis inferentially rather than testing it directly.

A handful of researchers (e.g., Bettencourt, Gillet, Gall, & Hull, 1983; Brigham,Scruggs, & Mastropieri, 1992; Burts, McKinney, & Burts, 1985) have tested the effects of teacher enthusiasm on student attention more directly. Bettencourt, Gillet, Gall, and Hull (1983) tested the hypothesis that teacher enthusiasm training improves student on-task behavior. Eighteen teachers of Grades 1 to 6 were randomly assigned to experimental and control conditions. Microteaching techniques were used to increase the experimental group's use of enthusiastic teaching behaviors, namely vocal variation, eye contact, demonstrative gestures, body movement, facial expression, and energy. All teachers were observed teaching a math lesson before and after the training period. A significant increase in enthusiastic teaching behaviors was found only for instructors who had participated in the training sessions. Student behavior was also recorded before and after the training program. Trained observers rated the on-task and off-task behavior of a different student every 5 seconds. On-task behavior (e.g., focusing on the teacher) was reported as a percentage of the total number of observations. Results showed that the percentage of on-task behavior did

not differ between groups prior to the training program but significant differences in student attention favoring the trained group were observed following the intervention. Within-group analyses also supported the predictions: significant improvement in attending behavior was observed only for experimental classes. Similar findings were reported by Burts, McKinney, & Burts (1985) in a study of pre-school children. However, it is important to note that Burts et al. used subjective rather than objective measures of attending behavior (i.e., observations by teacher rather than by independent observers).

Brigham, Scruggs, and Mastropieri (1992) extended the above findings by including a learning disabled (LD) population, and streamlining the operational definition and measurement of on-task behavior. A cross-over design was used with one Grade 8 LD class assigned to the "enthusiastic" condition in the first week, and the second LD class assigned to the control condition. In the second week, treatments were reversed for both groups. In the control condition, the instructor presented lectures from a seated position using a monotone voice. In contrast, the enthusiastic lecturer moved around the room, used vocal variation and projection, looked directly at students, and exhibited facial expressions. The lecture content was identical in both conditions. A manipulation check indicated significant differences in enthusiastic teaching behaviors across conditions.

Trained observers recorded the behavior of students using a time-sampling

technique. Every 60 seconds, observers recorded all students who were off-task (e.g., drumming pencils, playing with toys, talking, looking out windows) then recorded all students who were on-task (e.g., general orientation toward teacher, actively listening to teacher, task-relevant talking). As expected, the percentage of "off-task" behavior was significantly higher in control classes (36.2%) than in enthusiastic classes (22.9%).

Text Memory

Teacher enthusiasm may affect cognitive processes other than student motivation and attention. A third hypothesis, novel to the present research, proposes that enthusiastic behaviors facilitate learning because they emphasize the structure of the lesson, which in turn aids in the encoding and retrieval of text. More specifically, enthusiastic teaching behaviors are proposed to signal students regarding important information in oral text in the same way that headings signal readers regarding important information in written text. The frequency of occurrence of enthusiastic teaching behaviors has been found to vary *between* instructors who receive enthusiasm training and those who do not (e.g., Murray & Lawrence, 1980). It might be assumed that the frequency of certain enthusiastic behaviors (e.g., gestures, movement) may also vary *within* a lecture. It is proposed that this variability in behavior does not occur at random, instead, enthusiastic teachers are assumed to coordinate their gestures with the structure of the lesson. For example, enthusiastic

teachers may emphasize important points by raising their voice or waving their hands. This coordination between enthusiastic teaching behaviors and the format of the lesson is expected to cue students to important points, which in turn would aid the encoding and retrieval of that information.

How is the memory encoding hypothesis different from the selective attention hypothesis? The memory hypothesis takes the information processing properties of instructor enthusiasm one step beyond selective attention. The selective attention hypothesis refers to students' *general* orientation to the lecture. It is proposed that enthusiastic lecturers make the *entire* lecture seem more important and/or interesting than outside distractions. As a result, students of enthusiastic lecturers are hypothesized to process a greater percentage of lecture material than students of unenthusiastic lecturers. Alternatively, the memory hypothesis refers to the storage and retrieval of *specific* points *within* the lecture. Enthusiastic teaching behaviors are proposed to emphasize the structure of a lecture by highlighting major points with enthusiastic behaviors (e.g., gestures, movement). According to this hypothesis, signaled information is more likely to be processed in working memory and consequently is more accessible during retrieval than unsignaled information. The next section will include a review of Kintsch and van Dijk's (1983) theory of text memory, followed by a review of relevant research studies.

A theory of text representation. Kintsch and van Dijk's (1978) model of text

representation proposes one way in which textual information may be processed. One of the strengths of the model is its comprehensiveness, incorporating many topics in cognitive psychology, including memory and comprehension of written and spoken language. The model also takes both a top-down and bottom-up approach to text comprehension, where top-down processing refers to effects of high level goals and schema of the reader (e.g., background knowledge) and bottom-up processing refers to inputs from the text itself (Solso, 1995).

The model is based on the "proposition" as the basic unit of cognitive processing and representation. A proposition is "the smallest unit of knowledge that can stand as a separate assertion" (Glover, Ronning, & Brunning, 1990, p. 82). Solso (1995) identified the following characteristics of propositions: (1) they are abstractions based on reading a text or listening to a speaker, (2) they are retained in memory and follow the principles of the memory system, and (3) they contain a predicate and one or more arguments. For example, the sentence "*If Mary trusts John, she is a fool*" contains one predicate: "*if*", and two propositions: "*Mary trusts John*", and "*she is a fool*". This example demonstrates how propositions represent the meaning of sentences, rather than the sentences themselves (Glover et al., 1990).

Kintsch and van Dijk (1978) hypothesized that memory for text and comprehension of text are closely aligned. Therefore, in order to understand text processing, memory for text must first be analyzed. The first point made by Kintsch

(1982) was the superiority of an individual's memory for text or episodic text memory (ETM) compared to memory for a list of random words. Individuals can only remember 7 plus or minus 2 random words, whereas their recall of an expository text is considerably greater. Kintsch proposed that episodic text memory (ETM) is better than memory for random words because it is much better organized, more meaningful and interesting.

The following is an overview of the principle memory assumptions of the Kintsch & van Dijk (1978) model. Text is processed in cycles (e.g., one or two propositions at a time). Each cycle of information (e.g., proposition) is retained in short-term memory (STM) until the next cycle of information is processed. Formal rules determine (1) which propositions are retained and (2) how often they are selected for retention in the short-term memory buffer. Each time a proposition is processed, it is stored in long-term memory (LTM) with some probability. In order to ensure the continuity of the text base, some propositions are processed more than others. For example, structurally important propositions are processed more than once because they are essential to the comprehension process in several different contexts. Consequently, important text elements are well recalled since they are retained in working memory longer (for more cycles) than less important ones.

In 1983, van Dijk and Kintsch added the retrieval component to their model of text processing. Figure 1 outlines the basic components of the updated model.

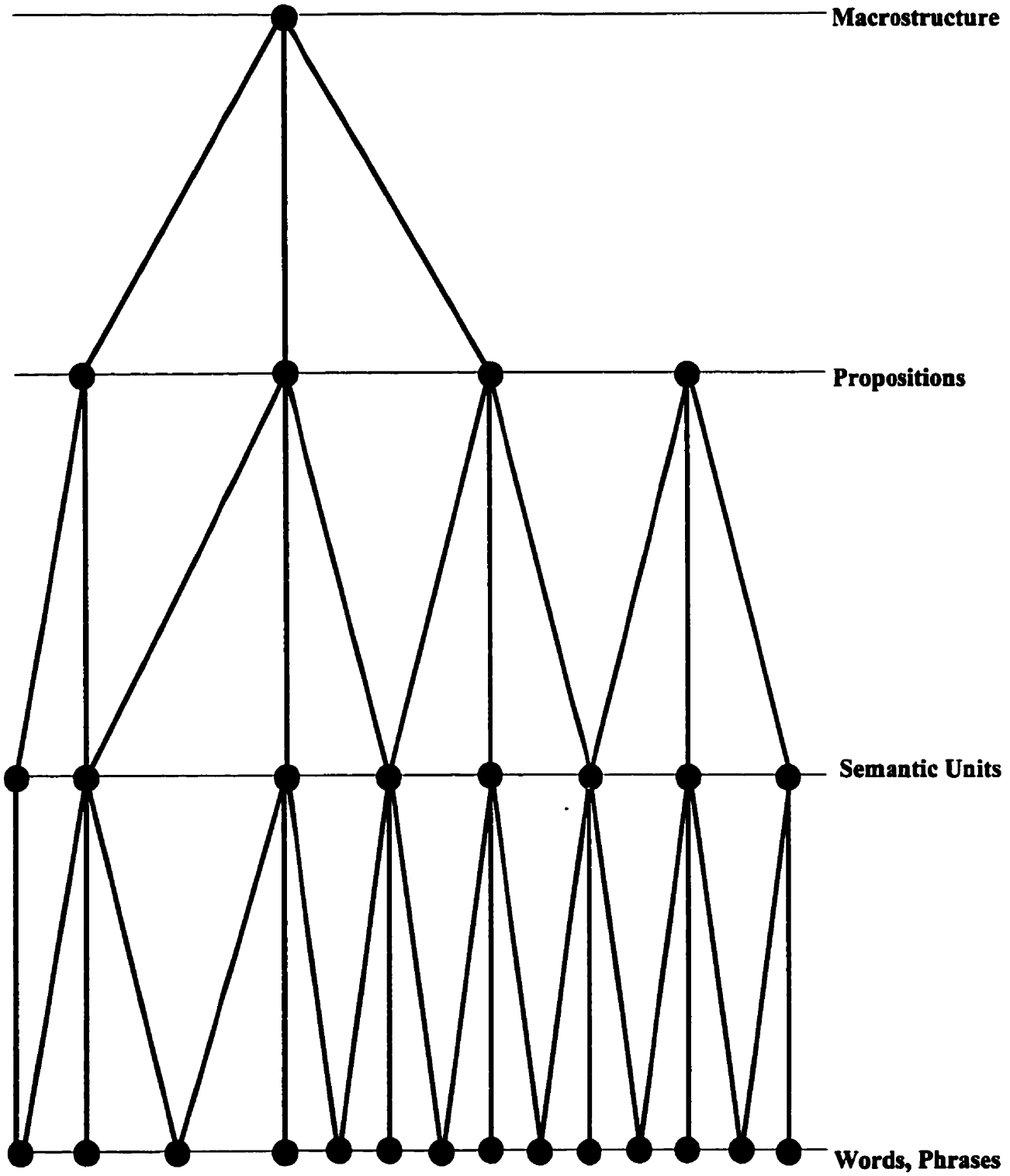

Figure 1. The structure of the van Dijk and Kintsch model of text processing.

Text comprehension is a process that occurs at several levels (e.g., words, semantic units, propositions, macrostructure). First there is the verbal representation of the text, strings of words organized into phrases, sentences, and paragraphs. The verbal input is then organized into semantic units, which represents the meaning elements of the text. Strategic rules determine which semantic units will be organized into larger chunks called text propositions. Semantic units continue to be fitted into the activated proposition "slot" until they are no longer related. At this time, a new proposition replaces the activated proposition in working memory, while the old proposition (which is filled with textual information) is stored in episodic text memory (ETM). This model proposes that reading a text results in the "storage of a sequence of interrelated chunks of textual information. Formally, each such chunk has the structure of a (text) proposition" (Kintsch, 1982, p. 193).

The final level of the van Dijk and Kintsch (1983) model is the macrostructure, which represents the "gist" of the text. The macrostructure plays a very important function in the retrieval system. Text propositions are hierarchically subordinated under various levels of the macropropositions. Consequently, recall of text involves a top-down search of a hierarchical text representation. Recall of subordinate information (e.g., microstructure) is contingent on retrieval of superordinate information (e.g., macrostructure) because access to subordinate content is controlled by the top levels of text structure.

Figure 2 outlines the processing characteristics of the van Dijk and Kintsch (1983) model. A sequence of words from the text enters the working register where multi-level analyses take place. The working register is regulated by a control schema, which includes the reader's goals, interests, and additional high-level information (e.g., knowledge of the topic being read). The working register also has direct access to the short-term memory where the current text proposition is held and new semantic units are added. "Full" text propositions move from short-term memory to episodic text memory. Consequently, a string of interrelated propositions is stored in long-term memory. Macropropositions are also generated at certain points in the process and stored in long-term memory.

The van Dijk and Kintsch (1983) model makes the same assumptions about memory storage as the Kintsch and van Dijk (1978) model did. Memory is a function of processing whereby propositions that are processed more often than others (e.g., because they are structurally central or particularly salient and macrorelevant) are remembered better. Unlike the earlier model, the van Dijk and Kintsch model (1983) makes specific predictions about the retrieval process. The retrieval of a proposition depends on the strength of the association between the proposition and its macroproposition which is also a function of processing. Propositions that are referred to in the development of a macroproposition are proposed to be more strongly related to it than propositions that are disregarded (e.g., not processed in the

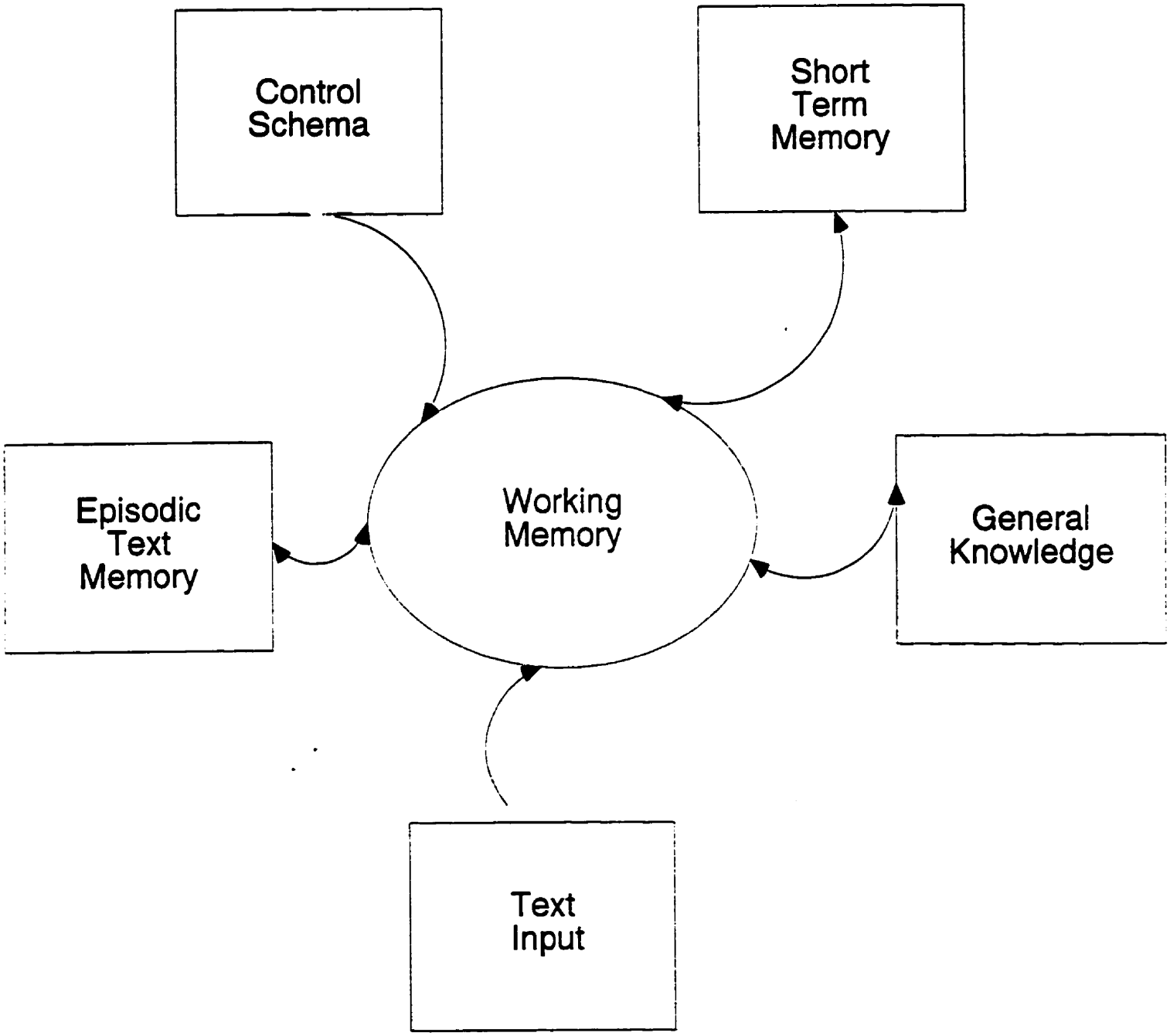

Figure 2. The processing characteristics of the van Dijk & Kintsch model.

working register).

In summary, recall in this model is a function of both storage and retrieval (Kintsch, 1982). Initial processing of text takes place in the short-term memory buffer, which has a limited capacity. Consequently, only a portion of the propositions are processed. Formal rules determine (1) which propositions are processed and (2) how often a proposition is processed in short-term memory. The more processing a proposition receives, the greater its storage probability. Retrieval differences also depend on the amount of processing. Propositions that are directly connected to a macroproposition are more readily retrieved than their counterparts since they are processed in short-term memory more frequently.

Structure strategy. Meyer and her colleagues (Meyer, 1975; 1984; Meyer, Brandt & Bluth, 1980; Meyer & Rice, 1982) proposed at the structure strategy, a specific version of the van Dijk & Kintsch's top-down search model that emphasizes the effects of text structure on what a reader learns and retains from text. The text structure specifies the associations between propositions in text as well as the subordination of some propositions to others. As illustrated in Figure 3, Meyer proposed that good readers are able to identify text topics and their interrelations. The topic structure representation is proposed to provide readers with "a systematic, organized strategy for encoding information from text and retrieving it from memory" (Meyer et al., 1980, p. 75). The structure strategy predicts that retrieval of a topic

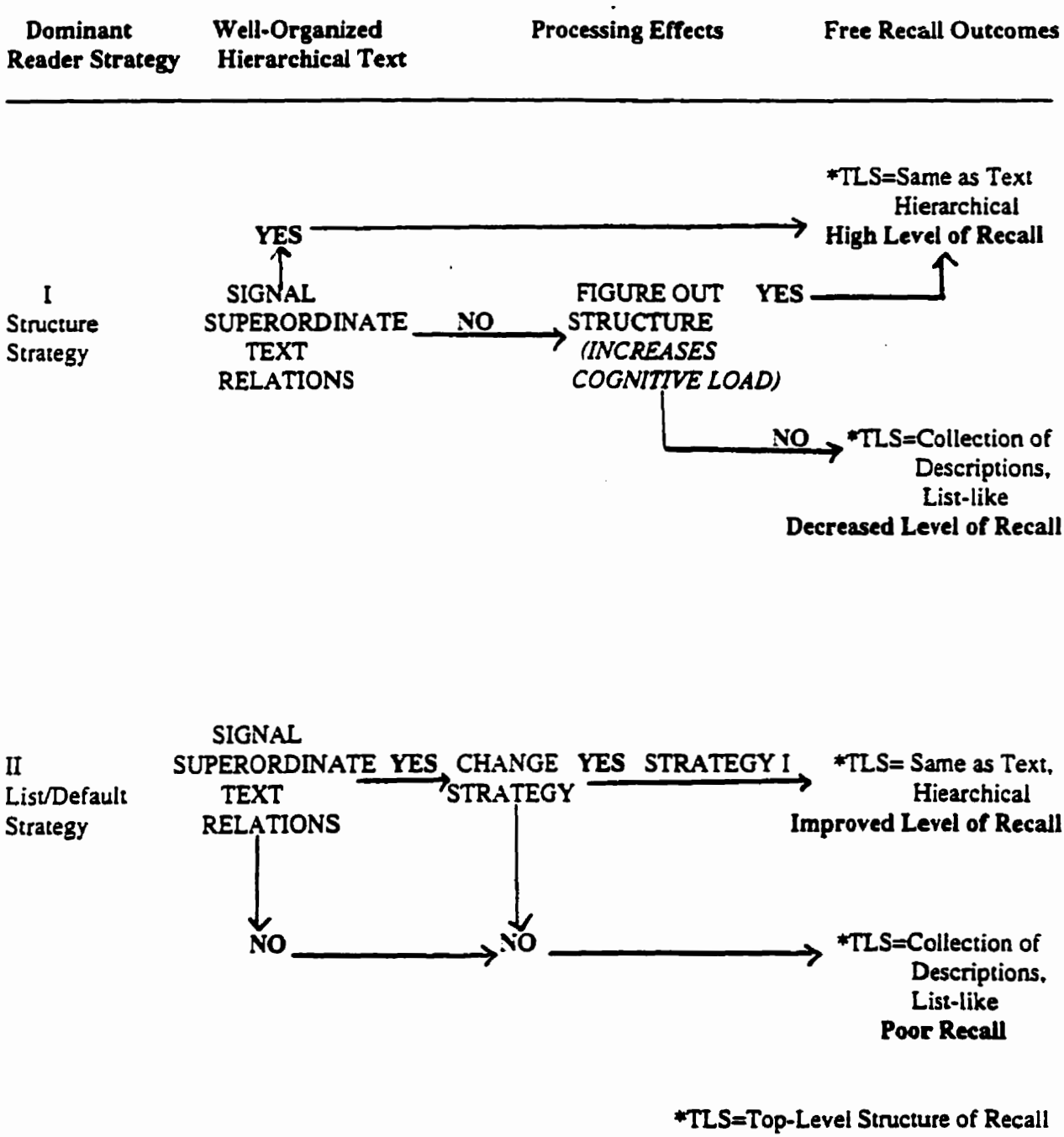

Figure 3. Model of reader strategies and signaling in text.

provides access to subordinate information related to the topic. If a topic fails to be integrated into the topic structure representation, then information subordinate to the topic will not be available for recall. In summary, text recall depends on the completeness and coherence of the topic structure representation (Lorch, Lorch, & Inman, 1993). Consequently, factors that influence the topic structure representation (e.g., teacher enthusiasm) will also affect topic recall and overall recall.

Lorch and Lorch (1985) tested the hypothesis that after reading a text, subjects use their representations of the topic structure to guide recall in a top-down fashion. Specifically, they proposed that when readers are asked to recall a text, they retrieve each topic from their topic structure representations. Retrieval of a topic provides access to information subsumed under that topic in memory. Once the information stored under that topic is recalled, the next topic in the topic structure is accessed. This process continues until all of the topics have been retrieved or they are no longer accessible.

Manipulations affecting topic structure (e.g., organization, advance information about topic structure) were expected to influence topic recall, which in turn was expected to influence overall recall. More specifically, a reader's topic structure representation was expected to be less well organized when the text is presented in random order rather than when it is presented in logical order. Consequently, fewer topics would be recalled in the random condition than in the

logical condition. Overall recall was also expected to differ between the two conditions, since topic retrieval affects recall of topic-related information.

To test these predictions, Lorch and Lorch (1985) conducted an experiment with 114 introductory psychology students in which the base text consisted of 1100 words describing six attributes (e.g., climate, economy) of two fictional countries. A separate paragraph was written on each of the 12 topics (e.g., 2 countries X 6 attributes). Three different versions of the text were constructed by ordering the paragraphs in different ways: (1) by country, (2) by attribute, or (3) randomly. Two alternative introductory paragraphs were also written, one which outlined the organization of the text, and a second one which talked about travelling in general. Subjects were assigned to one the six resulting conditions (3 X 2 factorial design).

Three recall measures were used: (1) topic recall, measured by the number of topics correctly recalled, (2) overall recall, measured by the number of propositions recalled, and (3) conditional recall, measured by the number of propositions recalled about a topic, given that the topic had been recalled. The results supported the structure strategy model in that subjects recalled fewer topics and less information in the random order condition than in the logical order conditions. Advance structure information also had a facilitative effect. Subjects in the random order condition recalled significantly more topics and topic-related information when they were informed of the topic structure.

The Lorch and Lorch (1985) study provides evidence for the structure strategy proposed by Meyer and her colleagues (Meyer, Brandt & Bluth, 1980; Meyer & Rice, 1982; Meyer, 1975; 1984). Altering the organization of a text's topic structure influences topic recall, which in turn affects overall recall. Informing readers about the a text's topic structure also improves recall, especially when text is randomly ordered. Further evidence for the structure strategy of text recall has been provided by research on signaling.

Signaling. If knowledge of a text's topic structure facilitates recall of text, then strategies that highlight topic structure should improve recall. One method used to emphasize the topic structure of text is signaling (e.g., Lorch, 1989; Lorch & Lorch, 1986; Lorch, Lorch, & Inman, 1993; Lorch, Lorch & Klusewitz, 1995; Loman & Mayer, 1983; Mayer, 1984; Mayer, Dyck, & Cook, 1984; Meyer, 1975; 1984; Meyer et al, 1980; 1982). Signaling has been defined as "information in text which does not add new content on a topic, but which gives emphasis to certain aspects of the semantic content or points out aspects of the structure of the content" (Meyer et al., 1980, p. 77). The present review will be limited to research on signals that cue information across large bodies of text (e.g., headings). Enthusiastic teaching behaviors are proposed to signal students to the structure of oral text in the same way that headings cue readers to the structure of written text.

In a review of relevant research, Lorch (1989) identified various signaling

Table 1
Signaling Devices in Expository Text

Titles

Headings and Subheadings

Repetition of content, including:

- Exact repetition of a statement for emphasis
- Certain types of preview statements
- Certain types of summary statements

Function indicators, including:

- Pointer words (e.g., thus)
- Pointer phrases (e.g., in summary)
- Pointer sentences (e.g., Let me summarize what has been said)

Relevance indicators, including:

- Pointer phrases or statements emphasizing particular content (e.g., "Let me stress that....)

Enumeration devices (e.g., numbering points in an argument)

Typographical cues, including:

- Underlining
- Change of appearance of print (e.g., boldface, color)
- Distinguishing content spatially (e.g., indentation, centering)

devices (e.g, titles, headings, repetition of content, and typographical cues) and the differences between them (see Table 1). First, different signaling devices emphasize different aspects of text. Some signals emphasize text organization (e.g., numbers), others highlight content (e.g., titles, typographical cues), while others emphasize both organization and content (e.g., headings, overviews). A second source of variation between signaling devices is their scope of operation. Some signals cue information across large sections of text (e.g., titles, headings), while others signal specific sentences (e.g., typographical cues). Narrow scope signals may have more selective effects on memory compared to general scope signals. A third source of variation that goes hand in hand with scope is clarity. Narrow scope signals are more specific in the information that they emphasize, whereas general scope signals are more ambiguous. The final difference between signaling devices is visual distinctiveness. Perhaps only signals that are visually distinctive (e.g., typographical cues) facilitate selective search reading strategies.

Lorch, Lorch, and Inman (1993) proposed several reasons for the mixed findings of past research on signaling in written text, including inadequate experimental conditions (e.g., length of text), and incomplete dependent measures (e.g., overall recall). Lorch, Lorch, and Inman attempted to overcome the weaknesses of past research by including dependent measures that directly test the top-down search model (e.g., topic recall, organization of recall), and by manipulating the

length and complexity of the text. Their first study examined the effects of signaling a text's topic structure on memory under varying text conditions. Length of text and complexity of topic structure were manipulated. Subjects read a text that either did or did not contain signals emphasizing the topic structure of the text (e.g., headings, topic overviews). It was hypothesized that signaling would influence both topic recall and topic organization. Signaling was also proposed to have a differential effect on long vs. short texts and simple vs. complex text structures. Short and simple texts were not expected to benefit as much from signaling in comparison to long and complex texts. The findings supported the first hypothesis. Subjects in the signaled condition recalled more topics. The recall organization of the signaled conditions was also more similar to the actual text structure. This was tested by a rank order correlation between the order of recall and the actual order of presentation of topics in the text. Consistent with the second hypothesis, rank order correlations were higher in the signaled condition.

A second study tested the top-down search strategy more directly. Whereas the first study had found that signaling enables readers to encode a text's topic structure more accurately, it is yet to be determined whether readers actually use their topic structure representation to guide memory search during free recall. If the top-down search model is correct, signaling is hypothesized to influence recall in three ways. First, signaled readers would be expected to construct more organized recalls.

Lorch, Lorch, and Inman measured recall organization by the clustering of propositions around the text topic, and the correlation between order of recalled propositions and order of presented propositions. Second, signaled readers should access more topics than unsignaled readers. This was measured by the number of topics for which at least one subordinate proposition was recalled. Third, signaled readers should recall more topic-related subordinate information than unsignaled readers. This was measured by a conditional recall score which was the proportion of propositions recalled for each topic.

The results supported the top-down search model. Consistent with the first study, recall organization of signaled readers was more similar to the actual text structure. For shorter texts, topic access scores were significantly higher in the signaled condition compared to the unsignaled condition. Contrary to expectation, signaling did not improve the proportion of propositions recalled for each topic. Signaling improved overall recall in the short text condition, but not in the long text condition. It was concluded that signaling improves access to topics but not topic-related information. Two explanations were proposed for this finding: recall interference and selective attention. The greater accessibility of topic structure information may interfere with access to subordinate information. Signaling may also cause readers to pay more attention to topic structure information to the detriment of details. If the second explanation is correct, then the selective effects of signals on

text memory are mediated by attention. Alternatively, signals may cause a change in the way content is stored in memory without necessarily causing an increase in the amount of attention to signaled content. Signaled information may be more accessible than unsignaled information because it has been "tagged" in memory as particularly important, not because it has received greater attention (Lorch, Lorch, & Klusewitz, 1995).

Present Research

Rationale of the Present Research

Although considerable research has been done on teacher enthusiasm, much less is known about the cognitive and affective mechanisms underlying the effects of teacher enthusiasm. In order to determine why and how teacher enthusiasm facilitates learning, hypotheses about cognitive and affective processes must be tested directly.

Selective attention. Several researchers have proposed that teacher enthusiasm improves learning because it increases student attention. Despite this consensus, few researchers have directly examined the allocation of attention during university lectures in relation to teacher enthusiasm. This section reviews the limitations of previous attention research and provides the rationale for furthering existing research.

The first criticism of past research is lack of a theoretical framework for the

selective attention hypothesis. For example, Bettencourt et al. (1983) based their hypotheses on speculation put forth by Rosenshine in 1970, while Brigham et al. (1992) based their hypotheses on the research findings of Bettencourt et. al (1983). The present investigation aims to remedy this situation by providing a theoretical framework for the study of attention in the classroom.

Attention has been defined as "the concentration of mental effort on sensory or mental events" (Solso, 1995, p. 120). Research on attention covers five main topics: (1) processing capacity, (2) selective attention, (3) level of arousal, (4) control of attention, and, (5) consciousness. The present study will focus on the first two aspects of attention, namely processing capacity and selective attention. Although several theories of attention exist, few theories are relevant to the processing of oral text.

Reynolds and his colleagues (e.g., Anderson, 1982; Reynolds, 1992; Reynolds & Anderson, 1982) proposed a theory of text processing called Selective Attention Strategy (SAS). According to SAS theory: "(1) text elements are processed to some minimal level and graded for salience, (2) extra attention is devoted to elements in proportion to their salience, and (3) because of this extra attention, or a process supported by the extra attention, salient text elements are learned better than other elements" (Lapin & Reynolds, 1994, p. 380). Salience is defined as "the property of standing out" (Anderson, 1982, p. 349). This theory proposes that information that

"stands out" is learned better than information that "blends in with the scenery" because it receives additional attention. In order for the selective attention strategy (SAS) to improve learning, two processes must be performed effectively. Salient information must first be recognized, and second, extra attention must be focused on that information. How do individuals determine which text elements stand out? According to Reynolds (1992), text salience is determined by text variables (e.g., figurative language, information density), reader variables (e.g., interest, motivation), and task variables (e.g., questions, instructions). For example, interesting phrases are more likely to capture a reader's attention than boring phrases.

A review of the literature on reader variables (e.g., manipulation of interest) may provide insight into the underlying mechanisms of teacher enthusiasm. Several studies have shown that students learn more from texts that they rate as interesting (e.g., Anderson, Shirey, Wilson, & Felding, 1987; Hidi & Baird, 1986; 1988; Hidi, Baird, & Hildyard, 1982; Shimoda, 1993). Anderson and his associates (1987) evaluated the selective attention strategy (SAS) by comparing subjects' recall, reading time, and secondary reaction time for interesting vs. generic sentences. Consistent with the selective attention model, attention duration, attention intensity, and sentence learning were significantly higher for interesting sentences. Similar findings were reported by Shimoda (1993). Interesting examples were found to increase the attention and reported interest of undergraduate students. Subjects were slower to

react to a tone (e.g., secondary task reaction time) when they were reading interesting examples compared to generic examples. The increased allocation of attention to the primary task (e.g., reading) may explain why students learn more from interesting text compared to generic text.

Students may also use the selective attention strategy in the classroom to differentiate important from unimportant information. Enthusiastic teaching behaviors may make the lesson more interesting, which would augment its importance and cause students to pay more attention to the lecture. The results of Brigham et al.'s (1992) study provide partial support for this hypothesis. Students of enthusiastic teachers displayed higher levels of interest in the lesson than students of nonenthusiastic teachers who simply read prepared notes from the front of the room. These students also exhibited higher levels of attending and learned more from the lesson. Reynolds' selective attention model will be applied to the study of attention in the present study of teacher enthusiasm.

A second shortcoming of earlier research on attention in the classroom is the operational definition of attention. In all three studies reviewed above, attention was defined as a general orientation toward the teacher (e.g., on-task behavior). This definition assumes a relationship between cognition (e.g., attention) and overt behavior. For example, students were labelled "off-task" if they were "drumming pencils, hands, feet, playing with toys or looking out windows" (Brigham et al., 1992,

p. 70). The main problem with this definition is that it may not capture all of the variability in attention. There may be individual cases where overt behaviors defined by the researcher do not correlate with attention (e.g., a student may be able to look out the window and simultaneously attend to the lecture). Therefore, future studies should include a second, independent measure of selective attention.

Kahneman's (1973) Capacity Theory of Attention provides the rationale for a second measure of attention. Capacity theory proposes that individuals have a fixed and limited amount of cognitive resources (e.g., attention). Although individuals may be able to perform more than one task concurrently (e.g., walking & talking), performance on the secondary task diminishes as cognitive effort (e.g., attention allocation) required by the primary task increases.

As a method for measuring attention allocated to the primary task, Kahneman (1973) developed what he called "probe measures of spare capacity". According to Kahneman's theory of attention and effort, the spare capacity available for secondary tasks decreases as the cognitive effort (e.g., attention) allocated to the primary task increases. Probe measures of spare capacity assume a direct correlation between the speed of response to an unpredictable probe (e.g., tone) and the amount of cognitive effort (e.g., attention) invested in the primary task.

Reynolds and his associates (e.g., Lapan & Reynolds, 1994; Reynolds, Trathen, Sawyer, & Shepard, 1993) used secondary task methodology to measure

attention during reading. The researchers assumed a direct relationship between attention intensity and secondary task reaction time. For example, subjects who responded slowly to a probe were assumed to be allocating more attention to the primary task (e.g., reading) than subjects who responded quickly to a probe. Secondary task methodology could also be used to measure attention in the classroom. Subjects would be required to respond to probes at random intervals throughout the lecture. Longer response times would indicate greater attention to the lecture.

A third consideration for future research is the addition of a *within* group measure of attention. To date, attention has been defined as *general* orientation to the lesson. Previous research have adopted a *between* group model of selective attention where on-task behavior is compared across groups. For example, students are assumed to be paying attention to the lecture when they are facing the teacher and listening to the lesson, as opposed to looking out the window or talking to classmates. The *between* group model of selective attention could be tested by comparing mean secondary task reaction times between groups receiving enthusiastic and unenthusiastic lectures. As noted above, future research should also include a more specific measure of attention, one that assesses selective attention *within* the lecture. Students may be more attentive at certain points *within* the lecture. For example, student attention may fluctuate with the rate of occurrence of enthusiastic teaching

behaviors. The occurrence of enthusiastic behaviors (e.g., humour, gestures) is expected to vary within the lesson. It is important to note that within-lecture variation in expressive teaching behaviors is not what is usually implied by teacher enthusiasm. Nonetheless, the present study aims to further existing research by exploring an expanded definition of teacher enthusiasm. The within-group definition assumes that enthusiastic instructors tell jokes, gesture with their arms, and move about the room only at appropriate times during the lecture. Reynolds' selective attention model proposes that individuals pay more attention to salient information. Therefore, any process that causes text elements to "stand out" from other text information (e.g., gestures, jokes) should encourage students to focus their attention.

It would be interesting to see whether Schmidt's (1994) hypothesis regarding attention and humour in printed text will generalize to the classroom. Schmidt proposed that humourous text material is "distinct" and "incongruous" from nonhumourous material, and therefore receives extra emphasis during encoding. Research on figurative language and selective attention supports this hypothesis (e.g.,Reynolds, 1992). Numerous research studies indicate that sentences are more salient when presented as metaphors in a story. For example, the sentence "The wall blocked his path" is interpreted literally in a prison escape story, and figuratively in a story on discrimination in the workplace. Readers take longer to read a sentence, take longer to react to a probe, and learn the sentence better when it is presented

figuratively as a metaphor. Consequently, processes that cause text elements to stand out are likely to augment attention during encoding.

The final justification for continuing research on student attention is the subject population used in past research. Participants in past studies of attention in the classroom were high school students or younger. The format of elementary school lessons is dramatically different from university lectures. For example, students are more likely to interact with peers in the elementary school classroom, whereas interaction is less frequent in lecture classes. The discrepancies between teaching formats minimizes the generalizability of earlier research results to undergraduate classrooms.

In summary, the present study attempts to expand upon existing research on attention in relation to teacher enthusiasm by: (1) incorporating a theoretical framework, (2) including two different measures of attention, (3) measuring both between and within group attention, and (4) using undergraduate students.

Text Memory. Researchers have not considered the effects of teacher enthusiasm on the encoding and retrieval of lecture material. It may be that enthusiastic teaching behaviors affect encoding of lecture material in memory, in addition to or instead of influencing motivation and attention. This hypothesis assumes that the frequency of enthusiastic teaching behaviors (e.g., humour, gestures) may vary within a lecture. It is proposed that this variability in behavior does not

occur at random. Instead, enthusiastic teachers are hypothesized to coordinate their enthusiastic behaviors with the structure of the lesson. This coordination between enthusiastic behaviors and the structure of the lesson is expected to aid in the encoding and retrieval of text. More specifically, enthusiastic teaching behaviors are proposed to signal students to important information in oral text in the same way that headings signal readers to important information in written text.

One of the basic premises of this hypothesis is the coordination between enthusiastic teaching behaviors and the main points of the lesson. Therefore, uniform use of enthusiasm across all parts of a lecture is not expected to facilitate topic structure representation to the same degree as strategic use of enthusiasm in relation to selected topics. Lorch, Lorch, and Klusewitz (1995) found that the effectiveness of typographical cues depended upon the frequency in which they were used. Subjects read one of three versions of 4-page text that was either: (1) 0% underlined (control), (2) 5% underlined (selective signaling), or (3) 50% underlined (over signaling). Results supported the selective (5%) use of typographical signals. Subjects in the selective signaling condition recalled significantly more information than subjects in the other two conditions.

How does this hypothesis differ from the *within*-group version of the selective attention hypothesis? Reynolds' (1982) acknowledges that the salience of a text element may influence other cognitive processes (e.g., encoding, retrieval)

instead of or in addition to attention. The selective attention strategy (SAS) and Kintsch and van Dijk's model of text memory assume that important text elements are well learned because they receive extra processing. However, the two models disagree about the time at which important text elements receive extra processing. The selective attention strategy (SAS) proposes that important text elements receive extra processing (e.g., attention) only when they are initially encountered, while Kintsch and van Dijk's model proposes that important text elements receive extra processing (e.g., recall into working memory) each time a subordinate text element is encountered. The present study will test both theories by examining both attention data (e.g., secondary task reaction time) and memory data (e.g., structure of recall).

Motivation for further learning. The first two hypotheses pertain to the effects of instructor enthusiasm on in-class learning. Alternatively, students may learn more from enthusiastic teachers because they are motivated to further their learning outside of class. Several studies have supported the extra-classroom motivational effects of teacher enthusiasm (e.g., Bettencourt et al., 1983; Murray, 1983b; Perry & Penner, 1990; Slater, 1981; Streeter, 1986). For example, first year students taught by enthusiastic instructors have been found to spend more time studying, and to be more likely to major in psychology than students taught by unenthusiastic instructors (Murray, 1983b). Similar results have been found in simulated classrooms. Undergraduate students who had watched videotaped lectures

of enthusiastic instructors performed better on a homework assignment (Perry & Penner, 1990), and were more likely to request further readings on the lecture topic (Slater, 1981) than students who had watched unenthusiastic instructors.

How do enthusiastic instructors influence student learning outside the classroom? Murray (1991) proposes that students "model or imitate the energy and commitment of an enthusiastic instructor, thereby increasing their own motivation for study outside the classroom" (p. 159). Bandura's (1986) theory of observational learning provides a basis for this hypothesis. According to Bandura, observers are more likely to imitate models that have competence, status, and power. It would appear that teachers are in a unique position to serve as models for their students (Brophy, 1998; Schunk, 1991; Stipek, 1993). Furthermore, if students are more likely to imitate the behavior of models that they perceive as competent, then students should be more likely to model the behavior of enthusiastic instructors than unenthusiastic instructors, since enthusiastic instructors consistently receive higher ratings of instructional effectiveness (Murray, 1983a, 1983b, 1985).

Brophy (1998) builds a strong case for the important role of teachers in helping to develop student motivation to learn. Social learning theory proposes that each person has a unique motivation system, developed through socialization with significant others (Bandura, 1986). Brophy (1998) asserts that teachers are important "significant others" in the lives of students. Students take cues from teachers on how

to respond to learning situations. Consequently, teachers have the power to shape student motivation through modeling. If a teacher presents a topic with enthusiasm, this suggests that the topic is interesting and worthwhile. This modeling of a teacher's own motivation to learn encourages students to value learning as a rewarding experience (Brophy, 1998).

This hypothesis has important implications for the present study. For example, even under circumstances where teachers display enthusiasm uniformly or randomly rather than in coordination with specific important topics, the motivation hypothesis implies that teacher enthusiasm should positively influence student motivation for further learning. Thus, an instructor's dynamic speech, movement about the room, and gestures may generally excite students about the topic but have minimal impact on their encoding of specific subtopics.

Design of the Present Study

The present study was a laboratory experiment conducted in a "simulated" classroom using videotaped lectures. Participants were randomly assigned to one of four treatment conditions. The Low Enthusiasm condition contained few if any enthusiastic teaching behaviors. The instructor simply read the lesson from prepared notes, periodically looking up at the camera and without moving behind the lectern. The High Enthusiasm/Strategic condition contained high levels of enthusiastic teaching behaviors, and these low-inference behaviors were coordinated with the

structure of the lesson and the importance of lecture material. For example, the instructor emphasized important points with hand gestures or vocal inflections. The High Enthusiasm/Random condition also included frequent use of enthusiastic behaviors, but these behaviors sometimes did and sometimes did not coincide with high topic level propositions or the beginning of new lecture topics. Instead, they were presented at random intervals throughout the lecture. The High Enthusiasm/Uniform condition featured frequent use of enthusiastic teaching behaviors, but their occurrence remained constant at all points throughout the lecture. This constant level of enthusiasm did not differentiate important from unimportant information.

Hypotheses

The first goal of the present research was to confirm the well-established relationship between enthusiastic teaching behaviors and student outcome measures. This will be tested by comparing student performance under four treatment conditions: High Enthusiasm/Strategic, High Enthusiasm/Random, High Enthusiasm/Uniform, and Low Enthusiasm). The following hypotheses were tested regarding performance differences under these four treatment conditions.

First, student learning (i.e., performance on a lecture-based recall test) was expected to be higher in the High Enthusiasm/Strategic condition than in the other three conditions (i.e., High Enthusiasm/Random, High Enthusiasm/Uniform, Low

Enthusiasm). The predicted difference in student learning between the High Enthusiasm/Strategic and Low Enthusiasm conditions was based on the established correlation between teacher enthusiasm and student learning (e.g. Murray, 1985; Perry & Penner, 1990). The predicted difference in student learning between the High Enthusiasm/Strategic and the High Enthusiasm/Random and Uniform conditions was based on research on signaling of written text. Enthusiastic teaching behaviors were proposed to signal students to important information in oral text in the same way that headings signal readers to important information in written text. Research on signaling of written text has shown that signals only improve text recall when they are used in a strategic manner (e.g., Lorch & Lorch, 1985; Lorch, Lorch, & Klusewitz, 1995). Consequently, random or uniform use of teacher enthusiasm were not expected to facilitate learning to the same degree as strategic use of enthusiasm in relation to selected topics.

Second, student ratings of teacher effectiveness were expected to be higher in all three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than in the Low Enthusiasm condition. The predicted differences in student ratings between the High and Low Enthusiasm conditions was based on instructional effectiveness research (e.g., Murray 1983a, 1983b, 1985), where significant correlations are found between enthusiastic teaching behaviors and perceived teaching effectiveness.

Third, motivation for further learning, as measured by (1) a questionnaire and

(2) student demand for further reading on the lecture topic, was expected to be higher in all three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than in the Low Enthusiasm condition. The predicted differences in student motivation between the High and Low Enthusiasm conditions was based on both theory and research. According to Bandura's (1986) theory of observational learning, participants in the three High Enthusiasm conditions were expected to model their instructor's enthusiasm behavior and thus to acquire increased enthusiasm or motivation for the subject matter. Past research supports the motivational effects of teacher enthusiasm. For example, students of highly enthusiastic instructors were more likely to register in senior psychology courses and request further reading on the lecture topic than students of unenthusiastic instructors (Murray, 1983b; Slater, 1981).

Fourth, selective attention to the lecture was also expected to differ between treatment conditions. Subjects were expected to be generally more attentive in the three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than in the Low Enthusiasm condition. In other words, students were expected to be more "on-task" during the three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than during the Low Enthusiasm condition, and secondary task reaction times were expected to be higher for the three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than for the Low Enthusiasm condition. The predicted between-group differences in selective attention were based on both theory and research.

Reynolds' (1992) Selective Attention Strategy (SAS) proposes that information that "stands out" receives more attention than information that "blends in with the scenery". Teacher enthusiasm was proposed to increase the salience of the entire lecture by making the lesson more interesting, which in turn would augment its salience and cause students to be more attentive. Consistent with SAS, investigators have found significantly higher rates of on-task behavior in classes taught by enthusiastic teachers (e.g., Brigham, Scruggs, & Mastropieri, 1992; Bettencourt, Burts, McKinney, & Burts, 1985; Gillet, Gall, & Hull, 1983).

Fifth, selective attention was also expected to vary within two of three High Enthusiasm conditions (i.e., Strategic and Random). Secondary task reaction times were expected to be higher during high levels of enthusiastic behaviors (e.g., gestures, movement) than during lower levels. The predicted within-group differences in secondary task reaction times were based on the present study's expanded definition of teacher enthusiasm. The occurrence of enthusiastic behaviors varied within both the High Enthusiasm/Strategic and High Enthusiasm/Random conditions. This within-lecture variation in teacher enthusiasm was expected to make certain text elements "stand out" from other text elements, which, according to Reynolds' (1992) selective attention model, would cause these text elements to receive extra attention.

Sixth, enthusiastic teaching behaviors that coordinate with the structure of the lesson were expected to aid in the encoding and retrieval of oral text. This was

tested by comparing recall structure, as measured by (1) overall recall, (2) topic access, (3) conditional recall, and (4) topic representation, across the four treatment conditions. Recall structure was expected to be highest in the High Enthusiasm/Strategic condition, followed by the High Enthusiasm/Random, High Enthusiasm/Uniform and Low Enthusiasm conditions respectively. The predicted between-group differences in text memory were based on both theory and research. Kintsch and van Dijk's (1978) theory of text memory proposes that text recall involves a top-down search of a hierarchical text representation. According to this model, recall of subordinate information is contingent upon recall of superordinate information because access to subordinate information is controlled by top levels of text structure. Therefore, any process such as signaling that highlights high-level textual information should improve text recall (Lorch, Lorch, & Inman, 1993). Teacher enthusiasm was proposed to signal high-level information (e.g., topics) in the lecture in the same way that headings signal high-level information in written text. One of the basic premises of this hypothesis is the coordination between enthusiastic teaching behaviors and the main points of the lesson. Consequently, neither random nor uniform use of teacher enthusiasm was expected to facilitate text memory to the same degree as strategic use of enthusiasm in relation to selected topics. Furthermore, uniform use of teacher enthusiasm was not expected to facilitate text memory to the same degree as random use of enthusiasm since 0% of topics in the High

Enthusiasm/Uniform condition were signaled by within-lecture variations in teacher enthusiam, whereas almost 50% of topics in the High Enthusiasm/Random condition were signaled by within-lecture variations in teacher enthusiam.

Seventh, for subjects in the High Enthusiasm/Random condition, recall of topics that were signaled by high levels of enthusiasm was expected to be greater than recall of unsignaled topics. Also, it was expected that the percentage of propositions recalled about signaled topics (i.e., conditional recall) would be greater than the percentage of propositions recalled about unsignaled topics.

Eighth, tests were performed to determine whether teacher enthusiasm directly influences text memory or indirectly influences text memory. Lorch and his colleagues(e.g., Lorch & Lorch, 1996; Lorch, Lorch, & Lorch, Klusewitz, 1995) suggested two alternative ways in which signaling could improve text memory. The tagging hypothesis proposes that signaled content is "tagged" in memory as particularly important, and therefore, signaled content is more accessible at retrieval than unsignaled content. If enthusiasm improves text recall without increasing attention to signaled content, then it could be concluded that enthusiasm directly affects the encoding of lecture material. Alternatively, the attention hypothesis proposes that the selective effects of signaling on text memory are indirectly mediated by attention. In other words, memory for signaled content improves because readers pay more attention to signaled than to unsignaled content. The following data would

support the mediating role of attention in signaling: within-group differences in attention (e.g., reaction time) combined with superior text representation.

The first set of hypotheses made specific predictions about the direct effects of teacher enthusiasm on student motivation, selective attention, and text memory. Results may show a significant impact of teacher enthusiasm on any or all of student motivation, selective attention, and text memory. However, such a result leaves open the question of which of these three variables or mechanisms actually mediates the relationship between teacher enthusiasm and student learning. A further goal of the present study was to determine which of the three models or theories outlined above best explains the relationship between teacher enthusiasm and student learning. This was done by testing specific and unique predictions generated by each of the three models, as explained above, and also through statistical control of variables in multiple regression analyses. For example, when student motivation is controlled, does the relationship between teacher enthusiasm and student learning change significantly? When selective attention is controlled, does the relationship between teacher enthusiasm and student learning change significantly? When text memory is controlled, does the relationship between teacher enthusiasm and student learning change significantly?

METHOD

Design

The participants in this research were 300 introductory psychology students (148 female, 152 male) at the University of Western Ontario, who participated to fulfill a course requirement. An additional 18 participants served in a preliminary pilot study. The 300 subjects participating in the main study were randomly assigned to one of the four treatment conditions defined above, that is, Low Enthusiasm, High Enthusiasm/Strategic, High Enthusiasm/Random, and High Enthusiasm/Uniform, with the restriction that each condition included 37 females and 38 males.

In order to create a simulated classroom environment, participants were tested in groups of 2 to 10. To equate subject characteristics as well as time of presentation across treatment conditions, groups of 2 to 10 subjects were randomly assigned to the four treatment conditions, and the four conditions were filled concurrently rather than sequentially. All other experimental conditions were identical across conditions.

Procedure

Each of the 300 participants was first asked to read and fill out a consent form regarding participation in the study (see Appendix A). Participants were then given introductory oral and written instructions informing them that the purpose of the study was to investigate factors contributing to effective classroom teaching in universities (see Appendix B). They were further instructed that they would be viewing a

videotaped lecture, approximately 16 minutes in length, presented by Professor Mary Dow of the Faculty of Education. Participants were told not to take notes during the lecture. The rationale behind this procedure was that note-taking could potentially interfere with the present study's measurement of attention. For example, participants may experience difficulty using one hand to take notes and another hand to press the button for the secondary task reaction time measure. Behavioral observations of on-task behavior could also be affected by note-taking. During the videotaped lecture, it would be difficult to differentiate between lecture-oriented note-taking and "doodling". They were also told that a tone would sound periodically throughout the lecture, and that they were expected to press the button on their desk as fast as possible every time they heard the tone. They were instructed that following the lecture, they would be asked to: (1) recall as many points as they could remember from the lecture, (2) complete a multiple choice test on the lecture, (3) rate the effectiveness of the instructor, and (4) complete a 5-item interest survey.

In order to present a life-size image of the instructor to students, the videotaped lectures were projected on a 4 X 4 foot overhead screen with a Sharp Videobeam Color Projector Unit (Perry & Penner, 1990; Perry & Magnusson, 1987). Group size was restricted to 10 so that each subject had a clear and approximately equal view of the overhead screen. Restricting the group size to 10 subjects also increased the accuracy of "time-on-task" observations.

Tones were presented at 30 to 90 second intervals while subjects viewed the 16-minute videotaped lecture. Participants were required to react to the tone by pressing a button on their desk, and reaction times were recorded automatically for all participants concurrently. Immediately following the lecture, subjects completed a teaching evaluation form, free recall test, multiple choice exam, and finally a student interest survey. The teaching evaluation form was given first to ensure that teacher effectiveness ratings were not influenced by test performance. The multiple choice test was given after the free recall test because the multiple choice questions could aid in the recall of lecture material. In order to hold conditions constant, participants were required to spend the full time limit on each questionnaire before going on to the next questionnaire. More specifically, subjects were given 5 minutes to complete the teaching evaluation form, 15 minutes to complete the free recall test, 10 minutes to complete the multiple choice test, and 5 minutes to complete the interest survey. Upon completion of the questionnaires, participants received a debriefing form (see Appendix C).

Treatment Conditions

All four versions of the videotaped lecture were constructed and presented by Mary Dow, an actor, communications consultant, and former speech and drama instructor at Fanshawe College. The same substantive points were presented in all four versions of the lecture and the length of each version was approximately 16

minutes. The lecture topic, "A Schema Theory of Reading Comprehension", was taken from an excerpt in an advanced educational psychology textbook by Glover, Ronning, & Bruning (1990). The text or script of the videotaped lecture is reproduced in Appendix D. A senior level psychology topic was chosen to reduce the likelihood that it had already been learned by participants in their introductory psychology course.

Certain variables were kept constant across all four versions of the videotaped lecture, including lecturer, length, lecture content, organization, and the use of visual aids. The script based on Glover, Ronning, and Bruning (1990) was used in constructing all four versions of the lecture. Thus, the same points were presented in the same order in all four conditions. However, the four videotaped lectures varied markedly in terms of teacher enthusiasm. Teacher enthusiasm was operationally defined in this study as consisting of the following expressive teaching behaviors: (1) speaking in a dramatic or expressive way, (2) variation in pitch and volume, (3) vocal inflection, (4) pausing to stress important points, (5) moving about while lecturing, (6) gesturing with hands or arms, (7) exhibiting facial gestures or expressions, (8) eye contact, and (9) humour. The lecturer relied upon her acting skills to implement these expressive behaviors in varying ways in the four versions of the videotaped lecture.

The Low Enthusiasm condition contained few if any enthusiastic teaching

behaviors. The instructor simply read the lesson verbatim from prepared notes, periodically looking up at the camera and not moving from behind the lectern.

The High Enthusiasm/Strategic condition contained high levels of enthusiastic teaching behaviors, and these low-inference behaviors were coordinated with the structure of the lesson and the importance of lecture material. For example, the instructor emphasized important points with hand gestures or vocal inflections. Prior to videotaping, the topic structure (i.e., macrostructure) of the lecture was determined using propositional analysis and this topic structure was incorporated into the lecturer's script (Kintsch, 1982). The instructor highlighted the macrostructure of the lecture in two ways. First, the instructor signalled the macrostructure of the lecture by exhibiting high levels of enthusiastic teaching behaviors at the beginning of new lecture topics (see Appendix E). For example, the lecturer paused, spoke more expressively, and/or moved toward the camera each time a new topic was introduced. Secondly, the lecturer varied the level of enthusiastic teaching behaviors within each topic. This variation in enthusiasm was determined by propositional type (i.e., high vs. low topic level). High topic level propositions support and/or elaborate upon the topic of the paragraph in which they are embedded, while low topic level propositions are less relevant to the topic structure of the text (Kintsch, 1982). Appendix F provides an example of high and low topic level propositions. High topic level propositions were signaled by higher levels of enthusiastic teaching behaviors(e.g.,

gestures). In contrast, low topic level sections of the paragraph were talked about with less enthusiasm (i.e., more matter of fact, fewer gestures).

The High Enthusiasm/Random condition also included frequent use of enthusiastic behaviors, but these behaviors sometimes did and sometimes did not coincide with high topic level propositions or the beginning of new lecture topics. Instead, they were presented at random intervals throughout the lecture. More specifically, enthusiastic teaching behaviors occurred appropriately during certain sections of the random lecture and inappropriately during other sections. For example, the instructor sometimes paused and spoke more expressively at the beginning of a new topic, and sometimes did this at other randomly determined locations in the text. Consequently, students may not have realized that a new topic was being introduced since the new topic was not signaled by the instructor's behaviour. Appendix G outlines which topics were signaled with high levels of teacher enthusiasm and which topics were not signaled in the High Enthusiasm/Random condition.

The High Enthusiasm/Uniform condition also featured frequent use of enthusiastic teaching behaviors, but their occurrence remained constant throughout the lecture. This condition is analagous to highlighting an entire essay with yellow highlighter. The instructor exhibited high levels of enthusiasm during both high and low topic level propositions, and at the beginning and the end of topics. This constant

level of enthusiasm did not differentiate important from unimportant information.

Dependent Variables

Selective attention. Attention was measured in two ways: on-task behavior and secondary task reaction time (STRT). On-task behavior was measured using Brigham, Scruggs, and Mastropieri's (1992) time sampling technique. Every 60 seconds, the investigator used the observation form shown in Appendix H to record whether each student in the testing session was on-task (e.g., "general orientation toward teacher, actively listening to teacher") or off-task (e.g., "drumming pencils, hands, feet, talking, looking out windows"). On-task behavior was reported as a percentage of the total number of observations for each subject.

To check the accuracy of behavioral observations, a second observer independently recorded on-task behaviour in four separate testing sessions. The second observer recorded the on-task behaviour of 17 participants and made 272 observations in total (i.e., 16 observations for each participant). The second observer, a PhD candidate in Educational Psychology, followed the same guidelines for on-task behaviour as the investigator but was kept blind to the experimental condition by wearing earplugs and facing the students rather than the video screen.

Interobserver reliability was determined by percentage agreement between the two observers' ratings of on-task behaviour. The two observers were in agreement 99.3% of the time. More specifically, out of the 272 times that both

observers rated on-task behaviour, the two observers gave different ratings only 2 times.

The second measure of attention was secondary task reaction time (STRT). Subjects were required to react to each of 20 interspersed 1000 Hz, 70-millisecond tones embedded in the audio track of the videotaped lecture. A two-channel digital storage oscilloscope was used to ensure that the amplitude of the tone was not significantly greater than the amplitude of the lecturer's voice. Accordingly, the volume of the tone was about the same as the lecturer's voice, clearly audible, but not so loud as to wipe out the voice.

In the High Enthusiasm/Strategic and the High Enthusiasm/Random conditions, 10 tones were placed at 60 to 90 second intervals during periods involving low levels of teacher enthusiasm, and ten tones were placed during periods involving high levels of teacher enthusiasm. This allowed for a *within* group measure of selective attention in addition to a *between* group measure of selective attention. In the Low Enthusiasm and High Enthusiasm/Uniform conditions, the 20 tones were placed at approximately the same temporal locations as had been selected for the High Enthusiasm/Strategic and High Enthusiasm/Random conditions.

Students reacted to each tone by pressing a button on their desk as quickly as possible. The time between the onset of the tone and the button press was measured in milliseconds by a digital timer. The digital timer allowed up to 10

subjects to be tested simultaneously. After each tone sounded, the researcher recorded each participant's reaction time on the data sheet shown in Appendix I. By the time the video finished, 20 secondary task reaction times (STRT) had been recorded for each subject. The measure of selective attention was the average STRT score for each subject.

Text memory/representation. Text memory was measured by performance on a free recall task. Free recall instructions were written at the top of a lined piece of paper. Participants were told to use the page to recall as many specific points as they could from the lecture. They were further instructed to be as accurate as possible, but not to worry about exact wording. Finally, they were told to give specific points rather than summarizing the gist of the lecture.

Four recall measures were used, as defined below: (1) overall recall, (2) topic access, (3) conditional recall, and (4) topic representation. Overall recall was measured by the total number of propositions recalled, with a possible range of 0 to 127 propositions. The complete list of the 127 propositions presented in the videotaped lecture is reproduced in Appendix J. Overall recall is a global measure of memory, whereas, the three remaining recall measures examined the selective effects of teacher enthusiasm on memory.

Topic access was measured by the number of topics for which at least one text proposition was accurately recalled, with a possible range of 0 to 17 topics. A

list of the 17 topics is reproduced in Appendix E. Explicit or implicit reference to a topic was not required for this measure. Topic access was credited when participants recalled one or more propositions from the corresponding subsection of the lecture text. Subjects were not directly asked to recall lecture topics since, "such a task would permit subjects to consciously reconstruct topics that they might otherwise have forgotten" (Lorch & Lorch, 1985, p. 140). According to Lorch, Lorch, & Inman (1993), topic access tests whether signaling a text's topic structure influences the encoding of that structure, or in the present context, whether strategic use of teacher enthusiasm improves recall of superordinate content (i.e., topics).

Conditional recall, the third measure of text memory, was developed by Lorch and his colleagues (1993) to test whether signaling a text's topic structure improves or interferes with memory for subordinate content once a topic is accessed. For example, "signaling may cause students to attend more to the text's topic structure at a cost of more superficial processing of subordinate content" (Lorch et al., 1993, p. 284). In the present study, conditional recall was used to assess the impact of teacher enthusiasm on recall of topic-related information. Conditional recall was scored as the percentage of propositions recalled about a topic, given that at least one proposition about a topic was recalled. For example, if a participant recalled 2 of the 10 propositions presented on a topic, then their conditional recall score for that topic would be 20%. The mean percentage was then calculated across all recalled topics

(i.e., excluding topics for which nothing was recalled).

The fourth measure of text memory was topic representation. Topic representation assesses whether signaling a text's topic structure influences organization of topics in memory, or whether strategic use of teacher enthusiasm causes topics to be encoded in the same order in memory as the actual order of presentation of topics. This measure assumes that "a subject whose recall organization matches the organization of topics in the text has better represented the topic structure of the text than a subject whose recall order diverges from the text order" (Lorch et al., 1993, p. 283). Topic representation was measured by the rank correlation between the order of recalled topics and the actual order of presentation of topics. For example, assume that a subject recalled 4 topics in the following order: 2, 1, 6, 8. These numbers were paired with the actual order of presentation of topics: (1, 2) (2, 1) (3, 6) (4, 8), and a rank order correlation coefficient calculated across these pairs. In this case, the rank order correlation is .80. A separate rank order correlation was computed in this way for each participant. Spearman's rho, a nonparametric version of Pearson's product-moment correlation coefficient was used for this purpose because it is based solely on ranks.

In addition to the text memory measures defined above, the High Enthusiasm/Random condition included two additional measures, namely random topic access and random conditional recall. Random topic access was measured in

the same way as the topic access score, with one difference. As indicated in Appendix G, random topic access divided the topic access score into two separate measures: (1) recall of signaled topics (N=7), and (2) recall of unsignaled topics (N=10). Since the number of signaled and unsignaled topics was unequal (i.e., 7 vs. 10), scores were converted into percentages. For example, if a participant recalled two signaled topics and four unsignaled topics, their signaled topic score would be 28.6% and their unsignaled topic score would be 40.0%. Random conditional recall was measured in the same way as conditional recall, with one difference. Random conditional recall divided the conditional recall score into two separate measures: (1) percentage of propositions recalled about signaled topics, and (2) percentage of propositions recalled about unsignaled topics.

The system for scoring recall protocols used in the present study was developed by Lorch and his colleagues (Lorch, 1989; Lorch & Lorch, 1986), and is based on Kintsch's system of propositional analysis (Kintsch & van Dijk, 1974). The main difference between the two scoring systems is the type of propositions scored. Lorch's system only analyzes major propositions corresponding to major clauses in sentences, while Kintsch's system analyzes both major and minor propositions.

Several studies have demonstrated the reliability of this scoring system (e.g., Lorch & Lorch, 1996; Lorch, Lorch, & Inman, 1993; Lorch, Lorch, & Mogan, 1987). Lorch and Lorch (1996) examined interrater reliability of this scoring system

by having one rater score recall protocols without knowledge of experimental condition while a second rater, also blind to experimental condition, scored a random subset of 20 recall protocols. The two raters assigned the same overall score 95% of the time, that is, 19 of 20 recall scores were identical. A second measure of interrater reliability examined the specific propositions credited by each rater. Agreement was scored when both raters scored a specific proposition as referring to the same topic. Disagreement was scored when both raters scored a proposition as referring to a different topic or when only one of the raters gave credit for a specific proposition. On this measure, the two raters were found to agree 82% of the time.

Lorch (1997) gave two arguments for adopting a less detailed approach to propositional analysis than that of Kintsch and van Dijk. First, Lorch stated that the type of propositional analysis used to examine recall protocols should depend on one's research goals. Researchers should be clear on what aspects of the message they want to examine (e.g., organization, recall of specific parts of the text), then determine a breakdown of content that focuses on memory of these aspects. Second, Lorch asserted that detailed systems such as that of Kintsch & van Dijk (1974) are unsuitable for most research questions because they often produce "broad" descriptions of content. Consequently, it is futile to analyze "all" of the content of a text and memory for that content if doing so fails to answer key research questions.

The master list of topics and core propositions shown in Appendix J was used to score recall protocols. Core propositions corresponded with major clauses within each sentence. For example, the sentence "*Many factors contribute to air pollution, but the burning of fossil fuels is a major source of such pollution.*" is a made up of two core propositions. The first core proposition is: "*Many factors contribute to air pollution.*" and the second core proposition is: "*The burning of fossil fuels is a major source of such pollution.*".

Once the master list was formulated, each subject's recall protocol was scored for "gist recall" of the 127 core propositions. More specifically, each recall protocol was broken down into propositions expressed by the subject. Next, an attempt was made to match recalled propositions with corresponding propositions from the master list. Lastly, if recalled propositions corresponded to an idea from the master list, then the number of the proposition from the master list was written above the recalled proposition. It is important to note that occasionally a single word in the recall indicated that the subject had remembered a specific proposition from the lecture text.

The present study used the same method as that of Lorch and Lorch (1996) to assess the reliability of the scoring system. The principal investigator scored the recall protocols of all 300 participants. A second rater, blind to experimental condition, independently scored 20 randomly selected protocols. The second observer, a PhD candidate in Educational Psychology, followed the same guidelines

for scoring as the principal investigator.

Two measures of interrater reliability was calculated. The first measure compared the two rater's overall recall scores. The two raters assigned the same overall score 85% of the time, that is, 17 of the 20 overall recall scores were identical. The second measure of interrater reliability examined the specific propositions credited by each rater. Agreement was scored when both raters scored a specific proposition as referring to the same topic. Disagreement was scored when both raters scored a proposition as referring to a different topic or when only one of the raters gave credit for a specific proposition. On this measure, the two raters were found to agree 100% of the time.

Lecture recall test. Subjects completed a 15-item multiple choice test, shown in Appendix K, that assessed participants' recall of lecture topics through mainly comprehension, application,and synthesis questions. Bloom's taxonomy of educational objectives guided the construction of the multiple choice test items (Woolfolk, 1993). Application questions required subjects to use a general concept learned in the lecture to solve a specific problem, for example:

While reading a textbook chapter on "Personality Disorders, Joe realized that he had already learned the sections on "Schizophrenia" and "Depression". Consequently, he sped up his reading until he encountered something new. Of the many functions that schemata serve in reading comprehension, which function does this best illustrate?

a. interpretation of reading material
b. summarization of content

c. editing of content
d. both (a) and (c)

Synthesis questions required subjects to come up with a new idea by combining different ideas learned in the lecture, for example:

When you read the sentence "Erin borrowed the antique tablecloth", you know more about the sentence than what is being explicitly stated. How is this possible?

a. schemata influence the interpretation of a sentence
b. new information is added to existing schemata
c. schemata enable readers to draw inferences about text
d. schemata are templates for information we already know

Student motivation. Student motivation for further learning was measured in two ways: a pencil-and-paper test and a behavioral measure. As shown in Appendix L, the pencil-and-paper test included 5 items requiring students to rate their degree of interest in learning more about the lecture topic. Each item was rated on a 5-point scale where scale values were defined as follows: 1=zero interest, 2=slightly interested, 3=moderately interested, 4=very interested, and 5=extremely interested.

Several theories of motivation (e.g., Deci and Ryan, 1985; Keller, 1983; Schiefele, 1991) justify the operational definition of student motivation as interest in further learning. Deci and Ryan (1985) argued that interest plays "an important directive role in intrinisically motivated behavior in that people naturally approach activities that interest them" (p. 34). Keller (1983) also identified interest as a critical component of student motivation. According to Keller, to improve student

motivation, teachers must stimulate and sustain student interest in class lessons.

Additional support for the operationalization of student motivation as interest in further learning is provided by Schiefele's (1991) in-depth research review. Based on findings of past research, a model was proposed that outlined causal relations between interest, general motivational orientations, cognitive capabilities, cognitive and emotional mediating processes, learning, and evaluation of the learning experience. According to this model, interest is always content-specific, in that it is related to a specific subject or activity. This model further proposed that interest is a prerequisite to subject-specific intrinsic motivation. In other words, when students are interested in a subject, they want to learn more about it. Schiefele's (1991) definition of interest provides strong support for the present study's operational definition of student motivation. One purpose of the present study was to investigate student motivation to learn more about the lecture topic. Therefore, an operational definition which focused on a more general motivation orientation (e.g., achievement motivation) would not have been suitable.

The second, behavioral measure of motivation was obtained by telling subjects that further reading on the lecture topic was available and would be mailed to them if they were interested. Interested subjects were asked to write down their name and address on a separate piece of paper. The same measure of motivation was used by Slater (1981). Requests for further reading is considered an ideal behavioral

measure of student motivation under the laboratory conditions of the current study. Laboratory experiments are limited in their choice of motivation measures since data are collected from simulated rather than actual classrooms. Consequently, motivation measures used in observational and field studies (e.g., amount of studying, senior course registration) are not available in laboratory experiments.

Student evaluation of teaching. Participants rated the effectiveness of the videotaped instructor using a 5-item questionnaire derived from The University of Western Ontario's Instructor and Course Evaluation form. As indicated in Appendix M, participants rated each item on a 7-point scale where scale values were defined as follows: 1=very poor, 2=unsatisfactory, 3=borderline, 4=satisfactory, 5=good, 6=very good, 7=outstanding.

Pilot Study

As a manipulation check, a pilot study was carried out in which 18 undergraduate university students (9 male, 9 female) viewed the four videotaped lectures and rated them on various scales as described below. The following three hypotheses were tested regarding the four treatment conditions to be compared in the experiment proper.

1. The three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) were expected to differ from the Low Enthusiasm condition in perceived or rated frequency of occurrence of enthusiastic teaching behaviors, but

not in perceived frequency of other types of teaching behaviors (i.e., clarity, pacing, organization, speech).

2. Student ratings of "overall enthusiasm" were expected to be higher for the three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than for the Low Enthusiasm condition.

3. Student ratings of degree of connectedness between enthusiastic teaching behaviors and the structure of the lesson were expected to differ significantly among the four conditions. More specifically, student ratings of degree of connectedness were expected to be highest for High Enthusiasm/Strategic condition, followed by the High Enthusiasm/ Random condition, and High Enthusiasm/Uniform, and Low Enthusiasm conditions, with the latter two conditions not expected to differ. This hypothesis was based on the fact that even though all three High Enthusiasm conditions were expected to have equally high levels of teacher enthusiasm, the High Enthusiasm/Strategic condition was the only condition in which enthusiastic teaching behaviors were consistently coordinated with the structure of the lesson and the importance of lecture topics. In contrast, the High Enthusiasm/Random condition coordinated enthusiastic teaching behaviors with the structure of the lesson about 50% of the time, while the High Enthusiasm/Uniform and Low Enthusiasm

conditions never coordinated enthusiastic teaching behaviors with the structure of the lesson.

The pilot study used a within-subjects design in which all four videotaped lectures being shown to each of the 18 subjects. A modified Latin square design was used to randomly order the presentation of the four videotaped lectures, with the restriction that the Low Enthusiasm condition was always presented first. This balancing technique ensured that each of the three high enthusiasm conditions appeared equally often (i.e., 6 times) at each ordinal of the last three positions.

The first group of six subjects watched the videotaped lectures in the following 1, 2, 3, 4 order: Low Enthusiasm, High Enthusiasm/Strategic, High Enthusiasm/Random, and High Enthusiasm/Uniform. The second group of six subjects watched the videotaped lectures in 1,3,4,2 order: Low Enthusiasm, High Enthusiasm/Random, High Enthusiasm/Uniform and High Enthusiasm/Strategic. The third group of six subjects watched the videotaped lectures in 1,4,2,3 order: Low Enthusiasm, High Enthusiasm/ Uniform, High Enthusiasm/Strategic enthusiasm, and High Enthusiasm/Random.

To check on whether experimental manipulations were implemented as intended, pilot subjects were asked to rate the frequency of occurrence of low-inference teaching behaviors in each version of the videotaped lecture, using a modified version of Murray's (1983) Teacher Behaviors Inventory (see Appendix N).

The TBI version used in the pilot study contained 27 items divided into five categories: Clarity, Enthusiasm, Pacing, Organization, and Speech. Students rated the frequency with which their instructor exhibited each TBI behavior on a 5-point scale where scale points were defined as follows: 1=almost never, 2=rarely, 3=sometimes, 4=often, and 5=almost always. Participants also rated the instructor's overall level of enthusiasm on a 5-point scale where 1=low, 3=medium, and 5=high (see Appendix O), and as a check on whether teacher enthusiasm was properly coordinated with the structure of the lesson in the different treatment conditions, participants rated: (1) the extent to which teacher enthusiasm was coordinated with the main points of the lecture, that is, occurred with increased frequency during main points and with decreased frequency during less important points; (2) the extent to which teacher enthusiasm served to reinforce the meaning of the lecture, that is, helped students understand the lecture; and (3) the extent to which the level of enthusiasm was appropriate to the points being discussed in the lecture (see Appendix O). Student ratings of connectedness of enthusiasm were given on a 5-point scale, where 1=almost never, 2=rarely, 3=sometimes, 4=often, 5=almost always.

Each of the 18 pilot study participants were asked to read and fill out a consent form prior to participating in the pilot study (see Appendix P). Participants were given a printed copy of instructions, and introductory instructions were given upon arrival (see Appendix Q). Participants were told that they would be viewing

four different videotaped lectures, and that following each lecture they would be asked to rate the frequency of specific teaching behaviours. They were also asked to pay particular attention to differences in teaching style between the four videotaped lectures. Upon completion of the questionnaire, participants received the same debriefing form as participants in the main study, which is reproduced in Appendix C.

RESULTS

The Results section is divided into the following seven subsections: (1) pilot study; (2) construct validity of motivation, attention, and memory measures; (3) omnibus tests of treatment group differences; (4) tests of specific group differences, as predicted by alternative models of teacher enthusiasm; (5) within-group differences in secondary task reaction time; (6) within-group differences in topic access and conditional recall, and (7) multiple regression analysis of the mediating effects of motivation, attention, and text memory.

Pilot Study

The goal of the pilot study was to test for predicted differences among treatment conditions in enthusiastic teaching behaviors, overall enthusiasm, and degree of connectedness between enthusiastic teaching behaviors and the structure of the lesson.

Repeated Measures MANOVA of TBI Category Scores

The three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) were expected to differ from the Low Enthusiasm condition in the frequency of occurrence of enthusiastic teaching behaviors, but not in the frequency of other types of teaching behaviors (i.e., clarity, pacing, organization, speech). The pilot study used a within-subjects design with the same 18 participants evaluating all four videotaped

lectures. Since participants completed the same measures four consecutive times, a repeated measures MANOVA was performed to determine whether there were significant differences among treatment conditions in TBI category scores. TBI category ratings were obtained by computing the mean frequency rating for individual teaching behaviors within each of the five categories of the Teacher Behaviors Inventory (see Appendix N), with reverse coding used for the 6 negatively worded items indicated in Appendix N. The MANOVA analysis of TBI category ratings was significant $F(15,147)=10.27$, $p<.001$, suggesting that the five TBI category ratings in combination differentiated between treatment conditions.

To determine which TBI categories contributed to the significant multivariate effect, univariate results were also analyzed. As shown in Table 2, two of the five TBI category ratings differed significantly across conditions, namely Enthusiasm, $F(3, 51) =185.76$, $p<.001$, and Speech, $F(3,51)=15.22$, $p<.001$.

Planned Comparison of Cell Means

As noted above, univariate results identified predicted overall differences in TBI Enthusiasm ratings among the four conditions. It was further predicted that TBI Enthusiasm ratings of the three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) would not differ among themselves, but all three would differ significantly from TBI Enthusiasm ratings for the Low Enthusiasm condition. Planned comparisons among cell means in this and all further analyses were

conducted using Student's Multiple t test. Kirk (1995) recommends Student's Multiple t test for planned, orthogonal contrasts among treatment groups of equal sample size. As shown in Table 2, TBI Enthusiasm ratings were significantly higher in the three High Enthusiasm conditions than in the Low Enthusiasm condition. No significant differences in TBI Enthusiasm ratings were found among the three High Enthusiasm conditions. These findings support the predicted differences among the four treatment conditions.

Posthoc Comparisons of Cell Means

Contrary to expectation, univariate results also identified significant differences in TBI Speech ratings among the four conditions. To determine which groups differed significantly on Speech ratings, post hoc comparisons of cell means were conducted using Tukey's HSD q test. Kirk (1995) recommends Tukey's HSD q test for posthoc pairwise contrasts among treatment groups of equal sample size. As shown in Table 2, TBI Speech ratings were significantly higher for the High Enthusiasm/Strategic condition than for the other three treatment conditions (i.e., High Enthusiasm/Random, High Enthusiasm/Uniform, Low Enthusiasm).

Repeated Measures MANOVA of Individual Teaching Behaviours

A further repeated measures MANOVA was conducted to determine whether frequency ratings of individual TBI items, as opposed to TBI category scores, differed significantly across the four treatment conditions. A repeated measures MANOVA

Table 2
Mean TBI Category Ratings for Four Treatment Conditions

	Treatment Condition					
TBI Category	High Enth/ Strategic	High Enth/ Random	High Enth/ Uniform	Low Enthusiasm	Mean Square Error	Univariate F
Clarity	3.94	3.59	3.37	3.33	.41	3.50
Enthusiasm	4.05[a]	3.54[a]	3.94[a]	1.38[b]	.15	185.76*
Pacing	2.09	2.11	2.70	2.48	.46	3.44
Organization	3.19	3.10	2.96	2.60	.45	2.71
Speech	4.56[a]	3.54[b]	3.22[b]	3.61[b]	.39	15.22*

*p.<.01

Note: Different row superscripts denote mean differences significant at .01 level. For example, for Enthusiasm, the only significant difference is between the Low Enthusiasm condition and the three High Enthusiasm conditions.

significantly across treatment conditions, namely: "stresses most important points by pausing, speaking slowly", "speaks in a dramatic way", "moves about while lecturing", "gestures with hands or arms", "exhibits facial gestures", "avoids eye contact", "reads lecture verbatim", "smiles or laughs", "shows distracting mannerisms", "speaks at appropriate volume", "speaks clearly" and "speaks at appropriate pace". Consistent with expectation, 8 of the 12 individual teaching behaviours that differed across conditions were from the TBI Enthusiasm category. The remaining 4 significant behaviors that had not been expected to differ across conditions were as follows: "stresses most important points by pausing or speaking slowly", "speaks at appropriate volume", "speaks clearly" and "speaks at appropriate pace". To determine the nature of group differences on these four TBI items, posthoc Tukey HSD q tests were conducted on appropriate cell means. As shown in Table 3, mean ratings of "stresses most important points by pausing, speaking slowly, raising voice, etc." were significantly higher for the High Enthusiasm/Strategic condition than for the three other conditions. This finding was unexpected, but it makes perfect sense in retrospect in that the High Enthusiasm/Strategic instructor emphasized important points by pausing each time a new topic was introduced, whereas this did not happen consistently in any other condition. Consequently, higher ratings on "stresses most important points by pausing, speaking slowly, raising voice, etc." supports the intended manipulation of strategic enthusiasm.

As shown in Table 3, mean student ratings of "speaks at appropriate volume" were significantly higher for the High Enthusiasm/Strategic condition than for the other two High Enthusiasm conditions, but did not differ significantly between High Enthusiasm/Strategic and Low Enthusiasm conditions. This finding prompted further pilot study investigation of volume of presentation in the four treatment conditions. A decibel metre revealed slight differences in sound levels among the four lecture conditions (i.e., ranging from 68-71 dB). In response to this finding, adjustments were made in the volume of presentation of the four videotapes so as to equate the loudness of the instructor's voice across treatment conditions in the main study. Specifically, it was determined that the volume level of the videotape projector unit needed to be set at level 4 for the High Enthusiasm/ Uniform condition and at level 6 for the Low Enthusiasm condition.

It may be noted in Table 3 that mean ratings of "speaks clearly" were significantly higher in the High Enthusiasm/Strategic condition than the High Enthusiasm/Uniform and Low Enthusiasm conditions. This finding suggests that strategic enthusiasm produced greater perceived clarity of speech due to stressing most important points by pausing, speaking, slowly, etc.

Finally, mean ratings of "speaks at appropriate pace" were also significantly higher in the High Enthusiasm/Strategic condition than in the High Enthusiasm/Uniform and Low Enthusiasm conditions. This finding should be

Table 3

Mean Rated Frequency of Occurrence of Individual Teaching Behaviours for Four Treatment Conditions

Teaching Behavior	High Enth/ Strategic	High Enth/ Random	High Enth/ Uniform	Low Enthusiasm	Mean Square Error	Univariate F
Clarity						
gives several examples	4.11	3.83	3.50	3.67	.85	1.44
uses concrete examples	4.22	3.83	3.94	3.72	.51	1.64
fails to define new terms (R)	3.78	3.94	4.28	4.44	.94	1.77
repeats difficult ideas	3.11	3.17	2.89	2.83	1.13	.43
stresses important points	4.50[a]	3.17[b]	2.22[b]	2.00[b]	1.44	16.23*
Enthusiasm						
speaks in a "dramatic way"	4.67	4.22	4.89	1.00	.26	231.30*
moves about while lecturing	4.50	4.33	4.83	1.00	.39	147.05*
gestures with hands or arms	4.61	4.44	4.89	1.00	.26	232.61*
exhibits facial gestures	4.39	3.78	4.56	1.00	.72	68.05*
avoids eye contact (R)	4.56	3.83	4.50	1.00	.45	112.72*
tells jokes	1.83	1.44	1.61	1.00	.55	4.04
reads lecture verbatim (R)	4.67	4.22	4.00	1.00	1.18	42.62*
smiles or laughs	3.33	2.83	4.28	1.00	.86	39.60*
distracting mannerisms (R)	3.89	2.72	1.94	4.44	.95	24.20*
Pacing						
dwells excessively on obvious	2.28	2.44	2.83	3.00	1.05	1.93
digresses from major theme	1.83	1.83	2.28	1.83	.90	.99
covers too much material	2.17	2.06	3.00	2.61	.88	3.83
Organization						
gives preliminary overview	4.28	4.56	3.83	3.61	1.40	2.34
puts outline on blackboard	1.00	1.06	1.00	1.06	.03	.66
uses headings and subheadings	3.33	3.39	3.17	2.11	2.07	3.13
clearly indicates transition	3.89	3.39	3.44	3.06	1.33	1.60
periodically summarizes	3.44	3.11	3.33	3.17	.88	.48
Speech						
stutters, mumbles, slurs (R)	4.78	4.17	3.89	4.06	.71	3.78
speaks at appropriate volume	4.50[a]	2.67[b]	2.22[b]	3.50[ab]	1.42	12.80*
speaks clearly	4.67[a]	3.83[ab]	3.67[b]	3.61[b]	.78	5.60*
speaks at appropriate pace	4.28[a]	3.11[ab]	2.22[b]	2.67[b]	1.13	10.76*
says "um" or "ah" (R)	4.56	3.89	4.11	4.22	.67	2.06

*p.<.01

(R)=Reverse coded items

Note: Different row superscripts denote mean differences significant at .01 level. For example, for "stresses most important points", the High Enthusiasm/Strategic condition differs significantly from the other 3 conditions.

interpreted with caution since all four of the videotaped lectures were 16 minutes in length.

Repeated Measures ANOVA of Overall Enthusiasm and Connectedness Ratings

In addition to ratings on the 27 TBI items, pilot subjects also rated the instructor's overall level of enthusiasm on a 5-point scale, and ratings of overall enthusiasm were expected to be lower for the Low Enthusiasm condition than for the three High Enthusiasm conditions. As predicted, a repeated measures ANOVA showed that mean ratings of overall enthusiasm differed significantly among the four videotape conditions (see Table 4),$F(3, 51)=190.89$, $p<.001$. Also, planned comparison of cell means showed that, as predicted, enthusiasm scores for the three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) were significantly higher than enthusiasm scores for the Low Enthusiasm condition..

A further repeated measures MANOVA was performed to determine whether there were significant differences among the four videotape lectures in perceived strategic use of enthusiasm, or degree of connectedness between teacher enthusiasm and the structure of the lesson (see Appendix O). The overall MANOVA performed on the three questionnaire items assessing strategic use of enthusiasm was significant $F(9,153)=12.30$, $p<.001$, indicating that the three items in combination differentiated among the videotape conditions.

Univariate analyses were performed to determine which questionnaire items

Table 4
Mean Ratings of Overall Enthusiasm and Degree of Connectedness for Four Treatment Conditions

	Treatment Condition					
Measure	High Enth/ Strategic	High Enth/ Random	High Enth/ Uniform	Low Enthusiasm	Mean Square Error	Univariate E
Overall Enthusiasm	4.33[a]	3.72[a]	4.94[a]	1.00[b]	.29	190.89*
Degree of Connectedness						
Measure#1	4.72[a]	1.83[bc]	1.33[b]	1.11[bd]	.17	289.96*
Measure#2	4.39[a]	2.50[bc]	1.61[bd]	1.11[bd]	.25	149.82*
Measure#3	4.44[a]	2.28[bc]	1.56[b]	1.17[bd]	.17	289.96*

*p.<.01

Note: Different row superscripts denote mean differences significant at .01 level. For example, for Overall Enthusiasm the only significant difference is between the Low Enthusiasm condition and the three High Enthusiasm conditions.

contributed to the significant overall multivariate effect. Consistent with expectation, all three items differed significantly across enthusiasm conditions, namely: the extent to which teacher enthusiasm coordinated with main points, $F(3, 51)=289.96$, $p<.001$; the extent to which teacher enthusiasm reinforced the meaning of the lecture, $F(3,51)=149.82$, $p<.001$; and the extent to which teacher enthusiasm was appropriate to points being discussed within the lecture, $F(3,51)=101.37$, $p<.001$.

It was further predicted that student ratings of the degree of connectedness between enthusiastic teaching behaviors and the structure of the lesson would be highest for the High Enthusiasm/Strategic condition, followed by the High Enthusiasm/Random, High Enthusiasm/Uniform, and Low Enthusiasm conditions, respectively, with no differences expected between the latter two conditions. This hypothesis was based on the fact that coordination of teacher enthusiasm with lesson structure occurred consistently only in the High Enthusiasm/Strategic lecture, whereas coordination occurred in some but not all sections of the High Enthusiasm/Random lecture, and did not occur in any sections of either the High Enthusiasm/Uniform and Low Enthusiasm lectures.

Planned comparisons of cell means were conducted using Student's Multiple t-test. The first set of planned contrasts compared mean ratings of "the extent to which teacher enthusiasm coordinated with main points" (Measure #1 in Table 3). It may be noted that ratings of strategic enthusiasm were, as predicted, higher for the

High Enthusiasm/Strategic condition than for the other three conditions. Furthermore, the High Enthusiasm/Random condition had significantly higher ratings of strategic enthusiasm than the Low Enthusiasm condition. Contrary to expectation, the High Enthusiasm/Random condition did not have significantly higher ratings than the High Enthusiasm/Uniform condition.

The second set of planned contrasts compared cell means for "the extent to which teacher enthusiasm served to reinforce main points". As shown in Table 3 (Measure #2), ratings of strategic enthusiasm were higher in the High Enthusiasm/Strategic condition than in the other three conditions. Furthermore, the High Enthusiasm/Random condition had significantly higher ratings than both the High Enthusiasm/Uniform and Low Enthusiasm conditions.

The third set of planned contrasts compared cell means for "the extent to which teacher enthusiasm was appropriate to the points being discussed within the lecture". As shown in Table 3 (Measure #3), ratings of strategic enthusiasm were higher for the High Enthusiasm/Strategic condition than for the other three conditions. Furthermore, the High Enthusiasm/ Random condition had significantly higher ratings than the Low Enthusiasm condition. Contrary to expectation, the High Enthusiasm/Random did not have significantly higher ratings of strategic enthusiasm than the High Enthusiasm/Uniform condition.

Overall, the results of the pilot study verified the intended differences among

the four videotape conditions. Consistent with expectation, the three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) had higher ratings of both enthusiastic teaching behaviors and overall enthusiasm than the Low Enthusiasm condition. Secondly, student ratings of connectedness between enthusiastic teaching behaviors and lecture content were highest in the High Enthusiasm/Strategic condition.

Contrary to expectation, the four conditions differed significantly on three teaching behaviors related to speech. The first unexpected finding was group differences on "speaks at appropriate pace". However, as mentioned earlier, this finding should be interpreted with caution since all four of the videotaped lectures were 16 minutes in length. The second unexpected finding was group differences on "speaks at appropriate volume". This difference was remedied by using a decibel metre to equate the loudness of the instructor's voice across videotape conditions. The final unexpected finding was group differences on "speaks clearly". This finding suggests that strategic enthusiasm produced greater perceived clarity of speech due to stressing most important points by pausing, speaking, slowly, etc.

Construct Validity of Criterion Measures

The next set of analyses examined the construct validity of the measures of memory, attention, and motivation used in this research. Table 5 provides a brief operational definition of each criterion measure, and Table 6 shows Pearson correlation coefficients among criterion measures.

Table 5
Operational Definitions of Criterion Measures

Motivation Measures

Motiv1=Interest in Further Learning *(mean score on 5-item questionnaire)*
Motiv2=Request for Further Reading *(% of participants who submitted address)*

Attention Measures

Attent1=Secondary Task Reaction Time (STRT, *mean time in milliseconds)*
Attent2=On-Task Behaviour *(% time on-task)*

Memory Measures

Mem1=Overall Recall *(number of propositions recalled: max score=17)*
Mem2=Topic Access *(number of topics recalled: max score=127)*
Mem3=Conditional Recall *(mean % of propositions recalled about a topic)*
Mem4=Topic Representation *(correlation between order of recalled topics and order of presented topics)*

Student Learning Measure

Learning=Multiple Choice Test *score (max=15)*

Teacher Effectiveness Measure

Ratings=Teacher Effectiveness Rating *(max=7)*

Table 6

Correlations Among Criterion Measures for Entire Sample (N=300)

	Criterion Measures							
	Motiv1	Motiv2	Attent1	Attent2	Mem1	Mem2	Mem3	Mem4
Motiv1		.39*	.15*	.16*	.07	.10	.03	.09
Motiv2	.39*		.10	.12	.11	.13	.06	.08
Attent1	.15*	.10		.56*	-.08	-.05	.02	.16*
Attent2	.16*	.12	.56*		.05	.06	.03	.10
Mem1	.07	.11	-.08	.05		.85*	.42*	.12
Mem2	.10	.13	-.05	.06	.85*		.67*	.11
Mem3	.03	.06	.02	.03	.42*	.67*		.03
Mem4	.09	.08	.16*	.10	.12	.11	.03	

*p<.01, one-tailed test

Convergent validity. Construct validity was first tested by examining the convergent validity of alternative subscales used to measure motivation, attention, and memory subscales. Alternative measures of the same construct were expected to correlate positively and significantly (Nunnally & Berstein, 1994). As expected, a significant correlation was found between the two measures of motivation: Interest in Further Learning and Request for Further Reading (r=.39). A significant correlation was also found between the two measures of attention: Secondary Task Reaction Time (STRT) and On-Task Behaviour (r=.56). Three of the four measures of memory correlated significantly with each other. Topic access correlated significantly with both overall recall (r=.85) and conditional recall (r=.42). Overall recall also correlated significantly with conditional recall (r=.67). Contrary to expectations, rank order did not correlate significantly with either topic access (r=.12), overall recall (r=.11), or conditional recall (r=.03).

Discriminant validity. Construct validity was also tested by examining the discriminant validity of motivation, attention, and memory subscales. Measures of different constructs were expected to intercorrelate lower than measures of the same construct (Nunnally & Berstein, 1994). As seen in Table 6, the correlation between the two measures of motivation (.39) was higher than the correlation of either with unrelated subscales. More specifically, Interest in Further Learning correlated as follows with unrelated scales: Secondary Task Reaction Time (.15), On-Task

Behaviour (.16), Topic Access (.07), Overall Recall (.10), Conditional Recall (.03), and Topic Representation (.09); whereas Request for Further Reading correlated as follows: Secondary Task Reaction Time (.10), On-Task Behaviour (.12), Topic Access (.11), Overall Recall (.13), Conditional Recall (.06), and Topic Representation (.08). These results therefore support the construct validity of the two measures of motivation.

Table 6 also shows that the intercorrelation of the two measures of attention (.56) was higher than the correlation of either measure of attention with unrelated subscales (i.e., motivation, memory). More specifically, Secondary Task Reaction Time (STRT) correlated as follows with other measures: Interest in Further Learning (.15), Request for Further Reading (.10), Topic Access (-.08), Overall Recall (-.05), Conditional Recall (.02), and Topic Representation (.16), whereas On-Task Behaviour correlated as follows: Interest in Further Learning (.16), Request for Further Reading (.12), Topic Access (.05), Overall Recall (.06), Conditional Recall (.03), and Topic Representation (.10). These results thus support the construct validity of the two measures of attention.

As seen in Table 6, the four measures of memory showed significant intercorrelations but did not correlate significantly with any of the motivation or attention subscales. For example, a significant correlation was found between Topic Access and Overall Recall (.85), whereas the correlations between Topic Access and

each of the following unrelated scales were nonsignificant: Interest in Further Learning (.10), Request for Further Reading (.13), Secondary Task Reaction Time (.05), and On-Task Behaviour (.06). These results support the construct validity of the memory subscales.

Although not shown in Table 6, correlation coefficients were also calculated between each of the eight subscales and each of the following variables: teacher effectiveness rating, multiple-choice test score, and subject's gender. As expected, gender did not correlate significantly with any of the subscales (all r's less than .10), whereas multiple-choice test scores correlated significantly with six of the eight subscales, namely: Interest in Further Learning (.17), Secondary Task Reaction Time (.16), On-Task Behavior (.25), Topic Access (.32), Overall Recall (.32), and Conditional Recall (.26). Teacher effectiveness ratings correlated significantly with six of the eight subscales, namely: Interest in Further Learning (.33), Request for Further Reading (.22), Secondary Task Reaction Time (.35), On-Task Behavior (.44), Topic Access (.19), and Overall Recall (.17).

Omnibus Tests of Treatment Differences

The next set of analyses tested the general hypothesis that there would be significant differences among the four treatment conditions on the ten criterion measures defined in Table 5. Group means for the ten criterion measures are shown

in Table 7. Two outcome measures were not included in the preliminary MANOVA of group differences: Topic Representation and Request For Further Reading. Topic Representation was excluded from the MANOVA because of missing data. Request for Further Reading was not included because it is a binomial variable, and hence, chi-square was determined to be a more appropriate analysis.

MANOVA of Eight Criterion Measures

The preliminary MANOVA analysis of eight of the ten criterion measures across four treatment conditions was statistically significant $F(24,873)=19.66$, $p<.001$. These results suggest that the eight criterion measures in combination differentiated among the four treatment conditions.

To determine which variables contributed to the significant multivariate effect, univariate results were also analyzed. As may be noted in Table 7, each of the eight variables differed significantly across treatment conditions, including one measure of motivation: Interest in Further Learning; two measures of attention: Secondary Task Reaction Time and On-task Behaviour; three measures of memory: Topic Access, Overall Recall, and Conditional Recall; plus Multiple Choice Test score and Teacher Effectiveness Ratings.

One-Way ANOVA of Topic Representation Measure

It was necessary to exclude the Topic Representation measure of memory from the MANOVA because of missing data. Rank order correlations between order

Table 7
Group Means and Multiple Comparison Tests of Criterion Measures

Measures	High Enth/ Strategic M	High Enth/ Random M	High Enth/ Uniform M	Low Enthusiasm M	Mean Square Error	Univariate F
Motiv1	2.52[a]	2.23[a]	1.91[ab]	1.83[b]	.76	9.72*
Motiv2	.24	.25	.17	.09	.28	NA
Attent1	817.28[a]	829.85[a]	805.25[a]	471.26[b]	21045.72	107.14*
Attent2	98.25[a]	98.24[a]	95.69[a]	69.16[b]	120.91	124.54*
Mem1	6.92[a]	5.21[bc]	3.11[bd]	5.04[bc]	10.41	17.52*
Mem2	3.64[a]	2.87[bc]	1.99[bd]	2.87[bc]	2.61	13.10*
Mem3	23.80[a]	22.59[a]	15.61[b]	20.82[a]	93.13	10.52*
Mem4	.72[a]	.71[a]	.58[ab]	.35[b]	77.19	5.08*
Learning	8.76[a]	6.79[b]	6.48[b]	6.05[b]	5.11	21.05*
Ratings	5.21[a]	4.64[a]	4.78[a]	2.51[b]	1.95	55.90*

*p<.01

Note: Different row superscripts denote mean differences significant at .01 level. For example, for Ratings, the only significant difference is between the Low Enthusiasm condition and the three High Enthusiasm conditions.

of presentation and order of recall of topics could not be calculated for 25% of participants because they recalled one or fewer propositions. Consequently, a separate unequal N, one-way ANOVA was calculated for the Topic Representation measure, the results of which indicated that the mean correlation between order of topic recall and order of topic presentation also differed significantly across treatment conditions, $F(3,221)=5.08$, $p<.01$.

Chi-Square Analysis of Request for Further Reading Measure

One of the two motivation measures, Request for Further Reading, was obtained by asking subjects to write down their names and addresses on a piece of paper if they wanted to receive further reading on the lecture topic by mail. As noted above, results obtained for this measure constituted a binary variable (No=0, Yes=1), so that chi-square was the appropriate method of analysis.

Based on previous research showing a positive relationship between teacher enthusiasm and student motivation, it was expected that students in the three High Enthusiasm conditions would request further reading more frequently than Low Enthusiasm participants.

As may be noted in Table 7, 24.0% of participants in the High Enthusiasm/Strategic condition requested further reading on the lecture topic, as compared to 25.3% in the High Enthusiasm/Random condition, 17.3% in the High Enthusiasm/Uniform condition, and 9.3% of participants in the Low Enthusiasm

condition. Although results were in the predicted direction, a chi-square test indicated no significant difference in frequency of request for further reading among the four conditions, $X^2(3)=6.37$, $p>.05$.

Tests of Specific Group Differences

It was determined a priori that planned comparisons between specific treatment groups would be conducted for outcome variables that had significant univariate results, especially in cases where specific group differences were predicted by the three alternative models of teacher enthusiasm. As noted above, nine of the criterion variables had significant univariate results. To test predicted differences between conditions, nine sets of planned comparisons were conducted using Student's Multiple t test.

The first set of planned comparisons tested the hypothesis that multiple choice test scores would be significantly higher for the High Enthusiasm/Strategic condition than for the other three conditions (i.e., High Enthusiasm/Random, High Enthusiasm/Uniform, Low Enthusiasm). Student learning was expected to be highest in the High Enthusiasm/Strategic condition because it was the only condition that coordinated enthusiastic teaching behaviors with the structure of the lesson and the relative importance of lecture topics. According to the memory encoding model, teacher enthusiasm is expected to facilitate student learning only if teacher enthusiasm is coordinated with the conceptual structure of lecture material. According to the

motivation and attention models, on the other hand, teacher enthusiasm should facilitate student learning regardless of whether or not it is coordinated with lesson structure. In other words, all three High Enthusiasm conditions (Strategic, Random, and Uniform) should perform equally better than the Low Enthusiasm condition. As may be noted in Table 7, the results supported the memory encoding model, in that multiple choice test scores (i.e. learning) were significantly higher in the High Enthusiasm/Strategic condition than in all three other conditions.

The second set of planned comparisons tested the hypothesis that student ratings of teacher effectiveness would be higher in all three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than in the Low Enthusiasm condition. Research has found a positive relationship between frequency of enthusiastic teaching behaviors and student ratings of instructional effectiveness (e.g., Murray, 1983a). Since all three High Enthusiasm conditions involved higher frequencies of teacher enthusiasm behaviors than the Low Enthusiasm condition, they were expected to receive higher student ratings of teacher effectiveness. Consistent with expectation, Table 7 shows that student ratings of teacher effectiveness were significantly higher in all three High Enthusiasm conditions than in the Low Enthusiasm condition.

The third set of planned comparisons tested the hypothesis that student interest in further learning, as measured by the motivation questionnaire, would be higher in all three High Enthusiasm conditions (i.e., Strategic, Random, Uniform)

than in the Low Enthusiasm condition. This hypothesis follows from the motivational theory of teacher enthusiasm. This theory assumes that student motivation results from enthusiastic teaching behaviors, which occur with higher frequency in all three High Enthusiasm conditions. As shown in Table 7, mean student ratings of the five questionnaire items assessing student interest in further learning (i.e., Motiv1) were significantly lower for the Low Enthusiasm condition than for the High Enthusiasm/Strategic and High Enthusiasm/Random conditions. These findings provide partial support for the motivational theory of teacher enthusiasm. Contrary to expectation, no significant differences in student interest were found between the High Enthusiasm/Uniform and Low Enthusiasm conditions.

The fourth set of planned comparisons tested the hypothesis that secondary task reaction times would be higher in all three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) than in the Low Enthusiasm condition. The attentional model predicts that since all three High Enthusiasm conditions involve more frequent teacher enthusiasm behaviors than the Low Enthusiasm condition, subjects in all three High Enthusiasm conditions should be significantly more attentive than subjects in the Low Enthusiasm condition. As shown in Table 7, secondary task reaction times (i.e., Attent1) were significantly higher in all three High Enthusiasm conditions than in the Low Enthusiasm condition. These findings support the differences between conditions predicted by the attentional model.

The attention hypothesis was further tested by comparing on-task behavior in the Low Enthusiasm condition with on-task behavior in the three High Enthusiasm conditions. For the same reasons cited above, on-task behavior in all three High Enthusiasm conditions (i.e., Strategic, Random, Uniform) was expected to be higher than in the Low Enthusiasm condition. As shown in Table 7, on-task behavior (i.e., Attent2) was significantly higher in all three High Enthusiasm conditions than in the Low Enthusiasm condition. These findings are consistent with predicted differences based on the attentional model.

The sixth set of planned comparisons tested the hypothesis that overall recall scores would be highest in the High Enthusiasm/Strategic condition, followed by the High Enthusiasm/Random, High Enthusiasm/Uniform and Low Enthusiasm conditions respectively. This hypothesis follows from the memory encoding model of teacher enthusiasm. According to this model, even though all three High Enthusiasm conditions contain equal levels of teacher enthusiasm, only the High Enthusiasm/Strategic condition coordinates enthusiastic teaching behaviors with the structure of the lesson, and thus neither random nor uniform use of teacher enthusiasm is expected to facilitate text memory to the same degree as strategic use of enthusiasm. Furthermore, High Enthusiasm/Uniform and Low Enthusiasm conditions are not expected to facilitate text memory to the same degree as the High Enthusiasm/Random condition, because none of the topics in the first two conditions

are signaled by variations in teacher enthusiam, whereas almost half of the topics in the High Enthusiasm/Random condition are signaled by variations in teacher enthusiam.

As shown in Table 7, participants in the High Enthusiasm/Strategic condition had significantly higher overall recall scores (i.e., Mem1) than participants in all three other conditions (i.e., High Enthusiasm/Random, High Enthusiasm/Uniform, Low Enthusiasm). Participants in the High Enthusiasm/Random condition also recalled significantly more propositions than participants in the High Enthusiasm/Uniform condition. These findings partially support differences predicted by the memory encoding model, but two unexpected results were found. First, overall recall scores for the High Enthusiasm/Random condition did not differ significantly from overall recall scores for the Low Enthusiasm condition. Secondly, overall recall scores for the Low Enthusiasm condition were significantly higher than overall recall scores for the High Enthusiasm/Uniform condition. It is important to note that the direction of the second finding was opposite to what was expected.

The memory hypothesis was further tested by comparing topic access scores among treatment conditions. For the same reasons cited above, topic access scores were expected to be highest in the High Enthusiasm/Strategic condition, followed by the High Enthusiasm/ Random, High Enthusiasm/Uniform and Low Enthusiasm

conditions respectively. As shown in Table 7, participants in the High Enthusiasm/Strategic condition had significantly higher topic access scores (i.e., Mem2) than participants in all three other conditions (i.e., High Enthusiasm/Random, High Enthusiasm/Uniform, Low Enthusiasm). Furthermore, participants in the High Enthusiasm/Random condition had significantly higher topic access scores than participants in the High Enthusiasm/Uniform condition. These findings partially support predicted differences between conditions, but again two unexpected results were found. First, topic access scores for the High Enthusiasm/Random condition did not differ significantly from topic access scores for the Low Enthusiasm condition. Secondly, topic access scores for the Low Enthusiasm condition were significantly higher than topic access scores for the High Enthusiasm/Uniform condition. Again, the direction of the second finding was opposite to what was expected.

A further test of the memory hypothesis was achieved by comparing conditional recall scores across treatment conditions. For the same reasons cited above, conditional recall scores were expected to be highest in the High Enthusiasm/Strategic condition, followed by the High Enthusiasm/Random, High Enthusiasm/Uniform and Low Enthusiasm conditions respectively. Consistent with expectation, conditional recall scores (Mem3 in Table 7) were significantly higher for High Enthusiasm/Strategic and High Enthusiasm/Random conditions than for the

High Enthusiasm/Uniform condition. However, contrary to expectation, conditional recall scores were not significantly higher for the High Enthusiasm/Strategic condition than for either the High Enthusiasm/Random or Low Enthusiasm conditions.

The final test of the memory hypothesis was achieved by comparing topic representation scores across treatment conditions. For the same reasons cited above, topic representation scores were expected to be highest in the High Enthusiasm/Strategic condition, followed by the High Enthusiasm/Random, High Enthusiasm/Uniform and Low Enthusiasm conditions respectively. As shown in Table 7, the Low Enthusiasm condition had significantly lower topic representation scores (i.e., Mem4) than both the High Enthusiasm/Strategic and High Enthusiasm/Random conditions. This finding is consistent with expectation. However, contrary to expectation, topic representation scores for the High Enthusiasm/Strategic condition did not differ significantly from topic representation scores for the High Enthusiasm/Random condition.

Within-Group Differences in Secondary Task Reaction Time (STRT)

In addition to between-group differences in secondary task reaction times reported above, it was further hypothesized that secondary task reaction times would vary within the High Enthusiasm/Strategic and High Enthusiasm/Random conditions. More specifically, mean STRT was expected to be higher during high levels of

enthusiastic behaviors (e.g., gestures, movement) than during lower levels. This hypothesis was based on the present study's expanded definition of teacher enthusiasm. The within-lecture variation in teacher enthusiasm was expected to make certain text elements "stand out" from other text elements. Paired sample t-tests were used to compare mean secondary task reaction time during high and low levels of teacher enthusiasm. Since levels of teacher enthusiasm varied within only two of the videotaped conditions (i.e., High Enthusiasm/Strategic and High Enthusiasm/ Random), only two sets of paired sample t-tests were calculated.

Mean secondary task reaction time in the High Enthusiasm/Strategic condition was, as predicted, significantly slower during high levels of teacher enthusiasm (841.83 msec.) than during low levels of teacher enthusiasm (792.74 msec.), $t(74)=5.35$, $p<.001$. Similarly, mean STRT in the High Enthusiasm/Random condition was significantly slower during high levels of teacher enthusiasm (861.02 msec.) than during low levels of teacher enthusiasm (798.73 msec.), $t(74)=5.79$, $p<.001$. Both of these results support the within-group attention hypothesis, that is, the hypothesis that students pay closer attention to the lecture during high levels of enthusiasm than during lower levels.

Within-Group Differences in Free Recall

The fifth set of analyses examined whether student recall of lecture topics and propositions in the in the High Enthusiasm/Random condition was affected by

within-group variation in teacher enthusiasm. In the High Enthusiasm/Random condition, enthusiastic teaching behaviors occurred appropriately during some sections of the lecture and inappropriately during other sections. For example, the instructor sometimes paused and spoke more expressively at the beginning of a new topic, and sometimes did not. Recall of topics that were signaled with high levels of enthusiasm was expected to be greater than recall of unsignaled topics. Consistent with expectation, mean topic access scores were significantly higher for topics that were signaled (20.00) than for topics that were unsignaled (14.93), $t(74)=3.01$, $p<.01$.

It was also hypothesized that the percentage of propositions recalled (i.e., conditional recall) would be greater for signaled topics than for unsignaled topics. Contrary to expectation, conditional recall was not significantly greater for signaled topics (20.35) than than for unsignaled topics (18.28), $t(74)=.99$, $p>.01$, although the difference was in the predicted direction. This result suggest that even though enthusiastic teaching behaviors improved recall of topics, they did not improve recall of topic-related information.

Multiple Regression Analyses

Planned comparisons reported above were conducted to determine the nature of differences between treatment conditions on criterion variables, and on this basis to ascertain which constructs or processes (i.e., motivation, attention, memory) mediate the relationship between teacher enthusiasm and student learning. The final

set of analyses were intended to complement results obtained from planned comparisons of treatment conditions.

Multiple regression analyses were used to determine which of the three constructs (i.e., motivation, attention, memory) mediates the relationship between teacher enthusiasm and learning. Within this approach, experimental treatment conditions serve as dummy-coded independent variables, measures of motivation, attention, and memory are potential mediator variables, and student learning is the criterion variable. An attempt is made to find the mediating variable or set of mediating variables that best predicts criterion variance.

Figure 4 shows Baron and Kenny's (1986) model of the mediation of variables. According to Baron and Kenny (1986), a variable functions as a mediator when the following conditions are met: "(1) variations in levels of the independent variable significantly account for variations in the presumed mediator (i.e., Path a), (2) variations in the mediator significantly account for variations in the dependent variable (i.e., Path b), (3) when Paths a and b (i.e., mediating variable) are controlled, a previously significant relation between the independent and dependent variables is no longer significant (i.e., Path c)" (p. 1176).

Baron and Kenny (1986) recommended a series of multiple regression analyses to test for mediation. The first multiple regression analysis involves entering the independent variable (e.g., teacher enthusiasm) first, with the mediating variable

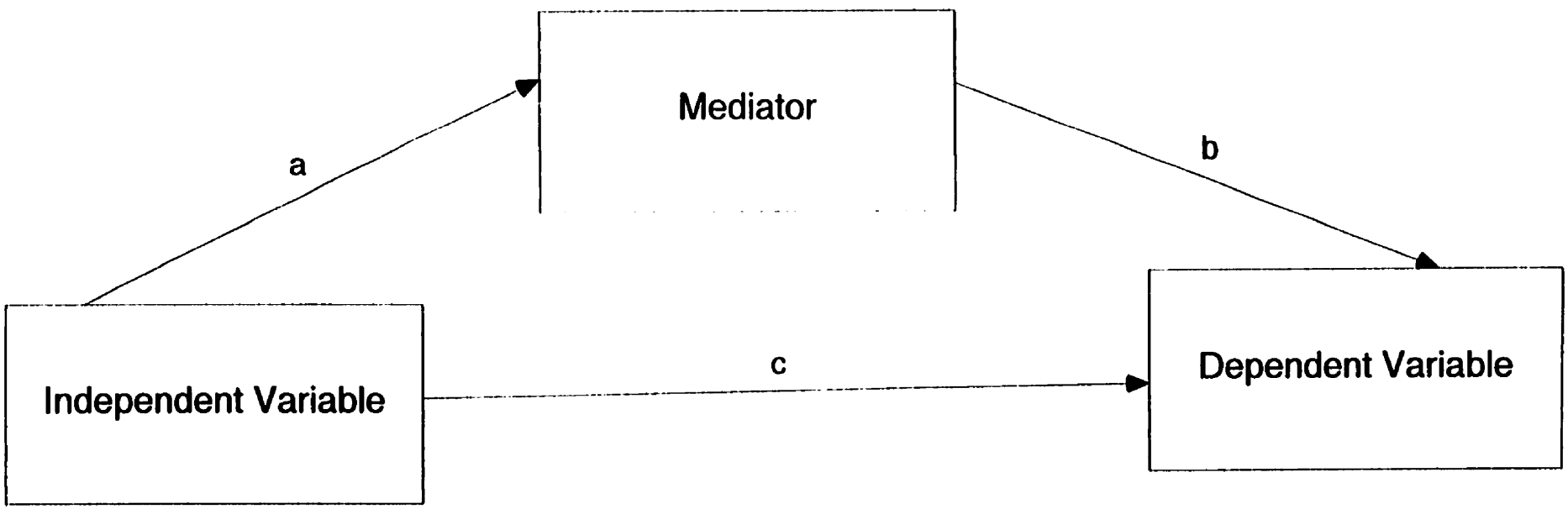

Figure 4
Mediational Model

(e.g., motivation) as the dependent variable. The first condition of mediation is met if the independent variable affects the mediating variable in the first equation (Path a). The second multiple regression involves entering the mediating variable (e.g., motivation first), with the criterion measure (e.g., student learning) as the dependent variable. The second condition is met if the mediating variable affects the dependent variable in the second equation (Path b). The third multiple regression equation involves entering the independent variable (e.g., teacher enthusiasm) as the independent variable and the criterion measure (e.g., student learning) as the dependent variable. The fourth multiple regression equation involves entering the independent variable (e.g., teacher enthusiasm) as the independent variable and the criterion measure (e.g., student learning) as the dependent variable, with the mediating variable (e.g., motivation) removed from the regression equation. The third condition is met if the effect of the independent variable on the dependent variable is less in a regression equation where the mediating variable is controlled (i.e., fourth equation above) than in a regression equation where the mediating variable is not controlled (i.e., third equation above). In the present study, the third condition of mediation was tested by comparing the change in Multiple R Square between the third and fourth multiple regression equations.

Combination of Subscales. The first regression analysis required the mediating variable to be entered as the dependent variable. Since regression analysis only

allows for a single dependent variable, it was necessary to combine subscales to produce a single measure of each of motivation, memory and attention. The single measure for each construct was obtained by converting raw scores on each subscale into standard scores and then aggregating standard scores across subscales for each construct.

In order to combine subscales into a single measure, it was necessary to demonstrate significant correlations between related subscales. As shown previously in Table 6, a significant correlation was found between the two measures of motivation (r=.39), and between the two measures of attention (r=.56). These significant correlations provide justification for the combination of subscales into a single measure of motivation and a single measure of attention. However, in the case of text memory, only three of four measures of memory correlated significantly with each other. Contrary to expectation, topic representation did not correlate significantly with topic access (r=.12), overall recall (r=.11), or conditional recall (r=.03). Therefore, only three of the four memory subscales (i.e., topic access, overall recall, conditional recall) were combined into one measure of memory.

Dummy Coding. One single continuous variable does not adequately represent the four enthusiasm conditions. Therefore, dummy coding was used to convert the four conditions into a quantitative form suitable for regression analysis (Cohen & Cohen, 1983). Teacher enthusiasm was transformed into a set of three

independent variables (i.e., vectors) with each enthusiasm vector expressing a unique distinction among the four enthusiasm conditions. As seen in Table 8, teacher enthusiasm was represented by a series of three dichotomies. For example, Enthusiasm Vector#1 is a dichotomy in which all High Enthusiasm/Strategic subjects are scored 1 and all other subjects are scored 0.

Test for Mediation of Motivation. The first set of multiple regression analyses tested the hypothesis that student motivation mediates the relationship between student learning. The first multiple regression analysis entered dummy-coded teacher enthusiasm as the independent variable with motivation as the dependent variable. As seen in Table 9, teacher enthusiasm significantly affected the mediator (i.e., motivation) in the first equation. Therefore, the first condition of mediation was met. The second multiple regression analysis entered motivation as the independent variable with student learning, as measured by multiple choice tests scores, as the dependent variable. As seen in Table 9, motivation significantly affected the dependent variable (i.e., student learning) in the second equation. Therefore, the second condition of mediation was met. The third multiple regression equation entered teacher enthusiasm as the independent variable and student learning as the dependent variable (see Table 9). The fourth multiple regression equation entered teacher enthusiasm as the independent variable and the criterion measure (e.g., student learning) as the dependent variable, with the mediating variable (e.g., motivation)

Table 8
Dummy Coding of Teacher Enthusiasm Conditions

Enthusiasm Condition	Enthusiasm Vector#1	Enthusiasm Vector#2	Enthusiasm Vector#3
High Enthusiasm/ Strategic	1	0	0
High Enthusiasm/ Random	0	1	0
High Enthusiasm/ Uniform	0	0	1
Low Enthusiasm	0	0	0

Table 9
Test of Mediation of Motivation

Regression Equation	Multiple R	R Square	Adjusted R Square	Standard Error	F
One	.27	.07	.06	1.61	7.56*
Two	.15	.02	.02	2.45	7.17*
Three	.41	.17	.16	2.26	21.05*
Four	.39	.15	.14	2.26	14.01*

*p<.01

removed from the regression equation (see Table 9). The change in Multiple R Square between the third and fourth multiple regression equations was not statistically significant, $F(1,295)=2.89$, n.s. Therefore, the third condition of mediation was not met. Controlling for the effects of motivation did not significantly change the relationship between teacher enthusiasm and student learning.

Test for Mediation of Attention. The second set of multiple regression analyses tested the hypothesis that student attention mediates the relationship between student learning. The first multiple regression analysis entered dummy-coded teacher enthusiasm as the independent variable with attention as the dependent variable. As seen in Table 10, teacher enthusiasm significantly affected the mediator (i.e., attention) in the first equation. Therefore, the first condition of mediation was met. The second multiple regression analysis entered attention as the independent variable with student learning, as measured by multiple choice tests scores, as the dependent variable. As seen in Table 10, attention significantly affected the dependent variable (i.e., student learning) in the second equation. Therefore, the second condition of mediation was met. The third multiple regression equation entered teacher enthusiasm as the independent variable and student learning as the dependent variable (see Table 10). The fourth multiple regression equation entered teacher enthusiasm as the independent variable and the criterion measure (e.g., student learning) as the dependent variable, with the mediating variable (e.g., attention) removed from the

Table 10
Test of Mediation of Attention

Regression Equation	Multiple R	R Square	Adjusted R Square	Standard Error	F
One	.83	.69	.68	.98	220.86*
Two	.23	.05	.04	2.42	16.69*
Three	.41	.17	.16	2.26	21.05*
Four	.40	.16	.15	2.25	14.34*

*p<.01

regression equation (see Table 10). The change in Multiple R Square between the third and fourth multiple regression equations was not statistically significant, $F(1,295)=2.62$, n.s. Therefore, the third condition of mediation was not met. Controlling for the effects of attention did not significantly change the relationship between teacher enthusiasm and student learning.

Test for Mediation of Memory. The third set of multiple regression analyses tested the hypothesis that text memory mediates the relationship between student learning. The first multiple regression analysis entered dummy-coded teacher enthusiasm as the independent variable with text memory as the dependent variable. As seen in Table 11, teacher enthusiasm significantly affected the mediator (i.e., text memory) in the first equation. Therefore, the first condition of mediation was met. The second multiple regression analysis entered text memory as the independent variable with student learning, as measured by multiple choice tests scores, as the dependent variable. As seen in Table 11, text memory significantly affected the dependent variable (i.e., student learning) in the second equation. Therefore, the second condition of mediation was met. The third multiple regression equation entered teacher enthusiasm as the independent variable and student learning as the dependent variable (see Table 11). The fourth multiple regression equation entered teacher enthusiasm as the independent variable and the criterion measure (e.g., student learning) as the dependent variable, with the mediating variable (e.g., memory)

Table 11
Test of Mediation of Memory

Regression Equation	Multiple R	R Square	Adjusted R Square	Standard Error	F
One	.39	.15	.14	2 .42	17.93*
Two	.34	.12	.11	2.33	39.55*
Three	.41	.17	.16	2.26	21.05*
Four	.36	.13	.12	2.28	11.49*

*p<.01

removed from the regression equation (see Table 11). The change in Multiple R square between the third and fourth multiple regression equations was found to be statistically significant, $F(1,295)=11.84$, $p<.01$. Therefore, the third condition of mediation was met. Controlling for the effects of text memory had a significant impact on the relationship between teacher enthusiasm and student learning. It is important to note that the relationship between teacher enthusiasm and student learning did not disappear when text memory was controlled. This finding suggests that text memory is a partial mediator rather than the single, dominant mediator (Baron & Kenny, 1986).

DISCUSSION

The major purpose of the present study was to determine the cognitive mechanisms underlying the effects of teacher enthusiasm. Although considerable research has been done on the relationship between teacher enthusiasm and student learning, much less is known about the cognitive and affective mechanisms underlying this relationship. In order to determine why and how teacher enthusiasm facilitates learning, hypotheses about three alternative cognitive or affective processes were tested, namely attention, motivation, and memory encoding.

The main findings of this research were as follows: (1) participants in the High Enthusiasm/Strategic condition performed better on the multiple choice test of student learning than participants in the other three conditions; (2) participants in all three High Enthusiasm conditions gave higher ratings of teacher effectiveness than participants in the Low Enthusiasm condition; (3) participants in the High Enthusiasm/Strategic and High Enthusiasm/Random conditions gave higher self-ratings of Interest in Further Learning than participants in the High Enthusiasm/Uniform and Low Enthusiasm conditions; (4) no significant group differences were found on the behavioral measure of student motivation (i.e., request for further reading), (5) participants in all three High Enthusiasm conditions had slower secondary task reaction times than participants in the Low Enthusiasm condition; (6) participants in all three High Enthusiasm conditions had higher on-task

behavior scores than participants in the Low Enthusiasm condition; (7) secondary task reaction times were higher during high than during low levels of enthusiastic teaching behavior in both the High Enthusiasm/Strategic and High Enthusiasm/Random conditions; (8) participants in the High Enthusiasm/Strategic condition had higher overall recall scores than participants in all three other conditions; (9) participants in the High Enthusiasm/Strategic condition had higher topic access scores than participants in all three other conditions; (10) no significant differences were found in conditional recall scores between High Enthusiasm/Strategic and the High Enthusiasm/Random and Low Enthusiasm conditions, (11) participants in the High Enthusiasm/Strategic and High Enthusiasm/Random conditions had higher topic representation scores than participants in High Enthusiasm/Uniform and Low Enthusiasm conditions, (12) topic access scores were significantly higher for signaled topics than for unsignaled topics in the High Enthusiasm/Random condition, (13) conditional recall scores were not significantly higher for signaled than for unsignaled topics in the High Enthusiasm/Random condition, (14) in multiple regression analyses, text memory was the only variable found to significantly mediate the relationship between teacher enthusiasm and student learning.

These results suggest that teacher enthusiasm produces significant effects on student motivation, student attention, and student memory encoding, as predicted by attention, motivation, and memory models. However, as argued in more detail

below, the text memory model seems to do a better job of accounting for the overall pattern of results obtained in this research than either the attention or motivation models. For one thing, only the memory model is able to account for the fact that student learning, as measured by the multiple-choice test, was significantly facilitated only when teacher enthusiasm was used strategically to emphasize important points in the lecture. Both the attention and motivation models predict, incorrectly, that student learning should have been facilitated by all three High Enthusiasm conditions. A second finding favoring the text memory model over the attention and motivation models is that in the multiple regression analyses, text memory was the only variable found to significantly mediate the relationship between teacher enthusiasm and student learning.

Although the text memory model seems to provide the best overall account of the present results, there is also evidence that teacher enthusiasm influenced text memory indirectly by way of student attention. More specifically, the signaling effects of teacher enthusiasm on text memory were found to be mediated by attention. Students were more attentive during high levels of enthusiastic teaching behaviors than during lower levels. Recall of signaled topics was also superior to recall of unsignaled topics. Therefore, memory for signaled content may have improved because students paid more attention to signaled sections of the lecture. In the following paragraphs, the findings of the present study are discussed in relation to

previous research and in relation to the three models of teacher enthusiasm tested in this study, namely student motivation, student attention, and student memory encoding.

Student Motivation

Previous research has indicated a positive relationship between teacher enthusiasm and student motivation (e.g., Bettencourt et al., 1983; Murray, 1983b; Slater, 1981; Streeter, 1986). Whereas previous research demonstrated a correlation between teacher enthusiasm and student motivation, the present study manipulated teacher enthusiasm experimentally to determine whether it has a cause-effect relationship to student motivation.

Results of the present study do not conclusively support the motivational effects of teacher enthusiasm, in that the two measures of student motivation produced mixed findings. Contrary to expectation, no significant group differences were found for the behavioral measure of motivation. More specifically, participants in the three High Enthusiasm conditions did not request further reading material on the lecture topic significantly more frequently than participants in the Low Enthusiasm condition. The second measure of motivation provided partial support for the motivation hypothesis. Consistent with expectation, student interest in further learning was higher in the High Enthusiasm/Strategic and High Enthusiasm/Random conditions than in the Low Enthusiasm condition. However, no significant

differences were found between the High Enthusiasm/Uniform and Low Enthusiasm conditions.

The inconsistency between the present findings and past research may be due to several reasons. First, the majority of studies examining teacher enthusiasm in relation to student motivation were conducted in regular classrooms (e.g., Bettencourt et al., 1983; Murray, 1983b; Streeter, 1986), whereas the present study was conducted in a "simulated" classroom using videotaped lectures. Several differences exist between regular and simulated classrooms, one of which is the amount of contact between students and instructor. In the present study, participants' watched one 15-minute videotaped lecture. In contrast, participants in Murray's (1983b) study observed the same instructor teach three 1-hour lectures every week over a course of 8 months. The modeling effects of teacher enthusiasm may take more than one exposure to have an impact on student motivation. Perhaps students need to observe their instructor in a variety of situations before they are motivated to model the enthusiasm of the instructor for the learning material. Social psychology research on modeling provides support for this conclusion (e.g., Grusec, 1981; Sorrentino & Rushton, 1981). In general, observational learning of altruistic behavior is less likely to occur in "one-shot" laboratory experiments than in real-world situations because of the absence of important socialization procedures (e.g., social reasoning).

A second difference between regular and videotaped instruction is the

opportunity for direct reinforcement. According to Bandura (1986), reinforcement plays a key role in observational learning. Individuals are more likely to imitate the behavior of a model if they expect to be reinforced for that behaviour. The regular classroom provides several direct reinforcement opportunities, such as instructor feedback, good grades, and long term rewards (e.g., admission into graduate school). In contrast, reinforcement opportunities in simulated classrooms tend to be vicarious rather than direct. Participants may imitate the videotaped instructor's enthusiasm because they expect to experience the same pleasure from their learning of the lecture material as the instructor did. However, research indicates that direct reinforcement has a stronger impact on imitative behavior than vicarious reinforcement (e.g., Austad, Sininger, Daugherty, Geary, & Stange, 1984; Bol & Steinhauer, 1990; Deguchi, Fujita, & Sato, 1988). For example, Deguchi, Fujita, and Sato (1988) found that vicarious reinforcement produced only temporary increases in modeled behavior, whereas direct reinforcement resulted in an instant increase in modeled behavior that remained constant over time.

A third difference between regular and videotaped instruction is the physical presence of an instructor. Enthusiastic teaching behaviors that generate "an increased sense of personal relationship" may lose their potency in simulated classrooms (Sherwood, 1987, p. 1278). For example, in regular classrooms instructors make eye contact with actual students, whereas videotaped instructors make eye contact with

the camera. Consequently, students may feel less "connected" to videotaped instructors. Secondly, teacher movement may not have the same impact on student motivation in simulated classrooms. In regular classrooms, teacher movement increases the number of students in personal, face-to-face contact with the instructor, and thus it reduces the psychological distance between instructors and students. In contrast, videotaped instructors never come into personal face-to-face contact with students, regardless of the amount they move.

Research on model attributes may further explain the lack of consistent support for the motivation hypothesis in the present study. According to Bandura (1986), observers are more likely to imitate models that have competence, status, and power. Consequently, participants in the present study were expected to model the behavior of effective, highly enthusiastic instructors. The problem with this hypothesis is that it fails to account for a second equally important observer perception: perceived similarity. The competence of the enthusiastic instructor may have been mitigated by a lack of perceived similarity. Participants may have perceived the enthusiastic instructor as being too different from themselves to be an effective role model. For example, participants may have thought to themselves: *"Sure, she's interested in schema theory, she's been a teacher for years, but why would I find schema theory interesting? I'm only a first year student."*.

Research on peer modeling demonstrates the importance of perceived

similarity between model and observer on behavioral change (Schunk, 1987; Schunk, Hanson, Cox, 1987). According to Schunk et al. (1987), individuals are more likely to model the behavior of their peers than their teachers, because peer models better enhance their self-efficacy. For example, when students observe their peers mastering a difficult task, they may think to themselves: "*If Joe can do it, there is no reason why I can't do it*". In contrast, students would have more difficulty identifying with a teacher with years of experience and education. The same student may think to himself: *"It's no wonder that Mrs. Jones knows how to do the calculus problem, she's been doing it for years.*".

Given the inconsistency of main effects of teacher enthusiasm on measures of student motivation, it is perhaps not surprising that motivation did not mediate the relationship between teacher enthusiasm and student learning in multiple regression analyses.

Selective Attention

Throughout the literature on teacher enthusiasm, researchers have proposed that teacher enthusiasm improves learning because it increases student attention (e.g., Perry & Magnusson, 1987; Perry & Penner; 1990; Murray, 1991, 1983a). Despite this consensus, few researchers have directly examined the allocation of student attention during university lectures. Results of the present study suggest that when student attention is explicitly measured, it is found to be directly affected by

teacher enthusiasm. For example, participants in all three High Enthusiasm conditions paid significantly more attention to the videotaped lecture than participants in the Low Enthusiasm condition.

Previous studies of the effects of teacher enthusiasm on the on-task behavior of elementary students have reported similar results (e.g., Bettencourt, Burts, McKinney, & Burts, 1985; Brigham, Scruggs, & Mastropieri, 1992; Gillet, Gall, & Hull, 1983). For example, Bettencourt et al. (1985) found significantly higher rates of on-task behavior in classes taught by enthusiastic instructors compared to classes taught by unenthusiastic instructors, and Brigham et al. (1992), using the same time sampling technique as the present study to measure on-task behavior, found that the percentage of on-task behavior was consistently higher in enthusiastic classes than in control classes.

The present study extended previous research by including a second measure of attention. Several studies have used secondary task methodology to measure selective attention to written text (e.g., Lapan & Reynolds, 1994; Reynolds, Trathen, Sawyer, & Shepard, 1993). The present study makes an important contribution to the literature by using secondary task methodology to measure selective attention to oral text. Consistent with on-task results, participants in all three High Enthusiasm conditions had higher secondary task reaction times than participants in the Low Enthusiasm condition. This second measure also enabled a

second, more specific test of the attention hypothesis: within-group differences in attention. Secondary task reaction times were expected to differ within the High Enthusiasm/Strategic and High Enthusiasm/Random conditions. As expected, participants' secondary task reaction times were significantly slower during high than during low levels of teacher enthusiasm in both conditions. These findings suggest that not only are participants "generally" more attentive to enthusiastic than to unenthusiastic lecturers, but participants are also more attentive within specific parts of enthusiastic lectures.

These results are not surprising considering the theoretical basis of the attention hypothesis. Reynolds' (1992) Selective Attention Strategy (SAS) proposes that information that "stands out" receives more attention than information that "blends in with the scenery". According to Reynolds (1992), text salience can be manipulated in one of three ways, namely: (1) reader variables (e.g., interest), (2) text variables (e.g., information density), and (3) task variables (e.g., questions). Teacher enthusiasm was proposed to increase the salience of the entire lecture by manipulating reader variables. In other words, enthusiastic teaching behaviors were expected to make the lesson more interesting, which in turn would augment lesson salience and cause students to be more attentive. Within-lecture variation in expressive teaching behaviors was also proposed to make specific sections of the lecture "stand out" from other sections of the lecture.

It should be noted, however, that increased attention to the lecture in the present study did not guarantee increased learning of lecture material. Even though results supported the direct impact of teacher enthusiasm on selective attention, attention was not found to mediate the relationship between teacher enthusiasm and student learning in multiple regression analyses. In other words, when selective attention was controlled, the relationship between teacher enthusiasm and student learning did not change significantly. It is important to note that regression analyses only examined the mediating effects of general attention to the lecture as a whole.

Several factors may explain why, contrary to Selective Attention Strategy (SAS), increased attention did not lead to increased learning. Although early SAS research assumed that attention mediated the relationship between salience and learning, it did not test mediation directly (e.g., Reynolds & Anderson, 1982). The assumed causal relationship between salience, attention, and learning was based on findings that both attention and learning were greater for salient than for less salient information. In order to test mediation directly, regression analyses must be performed (Baron & Kenny, 1987). For example, the relationship between salience and learning must be shown to change significantly when attention is controlled.

Results were mixed when regression analyses were used in previous research to test the mediating role of attention in learning of written materials (e.g., Reynolds, Shepard, Lapan, Kreek, & Goetz, 1990; Reynolds, Trathen, Sawyer, & Shepard,

1993). Support for the mediation hypothesis depended on the method used to manipulate the salience of reading material (e.g., text, task, reader). More specifically, the mediation hypothesis was not supported in studies that manipulated text salience using reader variables such as interest (e.g., Anderson, Shirey, Wilson, & Fielding, 1987; Shirey & Reynolds, 1988). Consistent with the present study, Shirey and Reynolds et al. (1988) found that interesting text attracted more attention and was better learned than less interesting text. However, contrary to SAS, there was no change in the relationship between interesting text and learning when attention was controlled for. In contrast, studies that manipulated text salience using task variables (e.g., focus questions) supported the mediating effect of selective attention (e.g., Reynolds, Shepard, Lapan, Kreek, & Goetz, 1990). These findings suggest that increasing the salience of an entire text by manipulating subject interest does not have the same impact on learning as increasing the salience of specific parts of a text.

The type of attention measured in the present study provides further insight into mediation results. Secondary task reaction time and on-task behavior reflect the quantity of attention focused on the lecture. However, these two measures fail to account for quality of attention. Jacoby (1983a; 1983b) differentiated between two types of attention: perceptual and conceptual. In reading, perceptual attention is required for basic processes such as decoding, while conceptual attention is necessary for reading comprehension. Jacoby (1983a; 1983b) found that subjects who allocated

more conceptual than perceptual attention to important text elements recalled more information from reading passages than subjects who allocated an equal amount of conceptual and perceptual attention to important text elements. These findings have important implications for the present study. Participants in the three High Enthusiasm conditions may have allocated an equal amount of perceptual attention to the lecture. In contrast, participants in the High Enthusiasm/Strategic condition may have allocated more conceptual attention to the lecture than participants in the other two High Enthusiasm conditions (i.e., Random, Uniform).

The distinction between perceptual and conceptual attention is an important one. However, the main drawback to this distinction is the way in which perceptual and conceptual attention are measured. Rather than being tested directly, attention is inferred from perceptual identification and conceptual recognition tasks given after the subject has read the text (Jacoby 1983a; 1983b).

Text Memory

Previous researchers have not considered the effects of teacher enthusiasm on text memory. Therefore, it seemed important to examine the specific causal effects of teacher enthusiasm on encoding and retrieval of lecture material. The memory model of teacher enthusiasm proposed in the present study is based on Kintsch and van Dijk's (1978) theory that text recall involves a top-down search of a hierarchical text representation. According to this theory, recall of subordinate

information is contingent upon recall of superordinate information because access to subordinate information is controlled by top levels of text structure. Therefore, any process that highlights high-level textual information should improve text recall (Lorch, Lorch, & Inman, 1993).

Teacher enthusiasm was proposed to signal high-level information (e.g., topics) in the lecture in the same way that headings signal high-level information in written text (e.g., Lorch, Lorch & Inman, 1993). One of the basic premises of this hypothesis is the coordination between enthusiastic teaching behaviors and the main points of the lesson. Therefore, uniform and/or random use of enthusiasm were not expected to facilitate text memory and therefore student learning to the same degree as strategic enthusiasm. Results are reviewed below for each memory variable separately, since each variable examines a unique aspect of the memory hypothesis.

Overall Recall. Consistent with expectation, participants in the High Enthusiasm/ Strategic condition recalled significantly more propositions than participants in the other three conditions. These results suggest that signaling the lecture's topic structure with strategic enthusiasm has the same effect on overall recall as signaling devices used in written text (e.g., Lorch, 1989).

Two unexpected results were found. Contrary to expectation, overall recall scores for the High Enthusiasm/Random condition did not differ significantly from overall recall scores for the Low Enthusiasm condition. This finding suggests that

random use of teacher enthusiasm has the same adverse effect on overall recall as low enthusiasm. Lorch and Lorch (1985) also found that readers' topic structure representation was adversely affected when the text was presented in random order. Subjects in the random condition recalled fewer topics and less information than subjects in the control condition.

The second unexpected finding was that overall recall scores for the Low Enthusiasm condition were significantly higher than overall recall scores for the High Enthusiasm/Uniform condition. This finding suggests that uniform use of teacher enthusiasm is actually worse than no use, and thus appears to be contrary to Lorch, Lorch, and Klusewitz's (1995) study, where no differences were found between recall scores for no signaling vs. heavy signaling conditions. Subjects in the Lorch et al. (1995) study recalled an equal amount of information regardless of whether the 0% of the text was underlined or 50% of the text was underlined. A comparison between the heavy signaling condition in Lorch et al.'s (1995) study and the High Enthusiasm/Uniform condition in the present study may explain the inconsistent findings. In the present study, uniform enthusiasm was characterized by constant high levels of enthusiasm throughout the lecture, therefore, in a sense, 100% of the text was signaled. In contrast, Lorch et al.'s (1995) heavy signaling condition involved underlining in only half of the text, such that only 50% of the text was signaled. One possible reason that signaling 100% of the text has such a deleterious effect on

memory is that it causes students to focus completely on the signaling device, while ignoring content. For example, participants may have been so mesmirized by the lecturer's constant movement and gestures in the High Enthusiasm/Uniform condition that they failed to process what she was saying.

It is important to note that overall recall is a global measure of memory and therefore does not examine the specific aspects of memory predicted to benefit from signaling by the top-down search model (Lorch, Lorch, & Inman, 1993). Topic access, conditional recall, and text representation provide more direct tests of Kintsch and van Dijk's (1978) top-down search model.

Recall of superordinate information. Topic access is a better test of the top-down search model than overall recall because it examines the selective effects of signaling on recall of superordinate information (i.e., topics). Consistent with expectation, subjects in the High Enthusiasm/Strategic condition recalled significantly more topics than subjects in the other three conditions. This result suggests that strategic enthusiasm signals high-level information in oral text in the same way that headings signal high-level information in written text. These findings, in conjuction with overall recall results, provide support for Kintsch & van Dijk's (1978) top-down search model of text processing.

Consistent with expectation, within-group differences in topic access scores were found in the High Enthusiasm/Random condition. Recall of topics signaled with

high enthusiasm was greater than recall of topics that were not signaled. This finding suggests that the signaling effects of teacher enthusiasm on topic recall are greater than the existing topic structure of the text. Participants took cues from the lecturer as to what was and was not important. It is important to note that the lecture topic was novel to the majority of participants, therefore, they did not have a preconceived notion of topic structure. The signaling effects of teacher enthusiasm on topic structure may be less strong when students have advanced knowledge of the lecture topic. Reading research has demonstrated an interaction between text familiarity and signaling. Lorch and Lorch (1995) found that readers who were unfamiliar with a topic benefited significantly more from signaling than readers who were familiar with a topic. Familiar readers already had a distinct topic representation of the reading passage in their minds, so that signaling was unnecessary.

Topic access produced the same unexpected findings as overall recall. First, topic access scores for the High Enthusiasm/Random condition did not differ significantly from topic access scores for the Low Enthusiasm condition. Secondly, topic access scores for the Low Enthusiasm condition were significantly higher than topic access scores for the High Enthusiasm/Uniform condition. These unexpected findings should be interpreted in the same way as overall recall results. For example, oversignaling in the High Enthusiasm/ Uniform condition may have caused subjects to focus on what the instructor was "doing", rather than on what she was "saying".

Recall of subordinate information. Topic access results demonstrated that strategic enthusiasm improved recall of superordinate information. Additional analyses were necessary to determine whether strategic enthusiasm improved recall of subordinate information once a topic is recalled. In other words, did improved topic recall result in superior recall of topic-related information?

Contrary to expectation, conditional recall scores for the High Enthusiasm/ Strategic condition were not significantly higher than conditional recall scores for either the High Enthusiasm/Random or Low Enthusiasm conditions. Even though strategic enthusiasm had a positive affect on recall of superordinate information, it did not facilitate recall of subordinate, topic-related information. Similarly, within-group differences in conditional recall scores were not found in the High Enthusiasm/Random condition. Conditional recall scores for topics that were signaled by enthusiastic teaching behaviors did not differ significantly from conditional recall scores for unsignaled topics.

The finding that strategic enthusiasm improved topic access without improving conditional recall is consistent with research on signaling in written text (e.g., Lorch & Lorch, 1985, 1995, 1996). Lorch, Lorch, and Inman (1993) proposed that signaling adversely affects conditional recall because it causes subjects to pay more attention to topics than to topic-related information. Results from the present study provide support for this hypothesis. Secondary task reaction times were

significantly higher during high levels of enthusiasm then during lower levels. These results suggest that participants were focusing more attention on lecture content signaled by high levels of enthusiasm compared to lecture content that was not signaled. Lorch, Lorch and Klusewitz (1995) found a similar pattern of results. Attention was measured by reading time. Subjects read sentences that were signaled with capitalization significantly more slowly than sentences that were not signaled. Consistent with present results, signaling was also found to have selective effects on memory. Signaling improved memory for signaled content, while having no effect on memory for unsignaled content.

Alternatively, the adverse effects of signaling on conditional recall may have occurred at recall. Lorch and Chen (1986) proposed two mechanisms to account for the selective effects of signaling, namely editing and output interference. These two mechanisms assume that the selective effects of signaling are caused by the recall process rather than the encoding process. The editing hypothesis proposes that subjects automatically delete unimportant information from their recalls. Signaling marks corresponding information as important, which prevents subjects from deleting signaled information from their recalls. The output interference hypothesis is related to the editing hypothesis. According to output interference, the greater accessibility of signaled topics at "output" (i.e., recall) interferes with access to subordinate, topic-related information.

Topic Representation. The final test of the memory hypothesis examined whether participants in the High Enthusiasm/Strategic condition recalled the topic representation of the lecture more accurately than participants in the High Enthusiasm/ Random, High Enthusiasm/Uniform and Low Enthusiasm conditions respectively. This hypothesis was tested by correlating the order of recalled topics by each subject with the actual order of presentation of topics. Consistent with expectation, participants in the Low Enthusiasm condition had significantly lower topic representation scores than participants in both the High Enthusiasm/Strategic and High Enthusiasm/Random conditions. However, contrary to expectation, topic representation scores for the High Enthusiasm/Strategic condition did not differ significantly from topic representation scores for either the High Enthusiasm/Random or High Enthusiasm/ Uniform conditions.

Closer inspection of recall data may provide insight into these unexpected findings. Missing data should be taken into consideration when interpreting these results. Approximately 25% of participants in the sample as a whole were excluded from topic representation analyses because they recalled one or fewer topics, thus making it impossible to compute a rank correlation between presentation and recall orders. Therefore, these results are not representative of the entire sample but instead represent only the top 75% of the sample. Participants with the lowest topic access scores (i.e., scores of 0 or 1) were excluded from rank order calculations. It may be

the case that group differences in topic representation are not as pronounced for the top 75% of scores as for the bottom 25%. It is also important to note that the percentage of cases excluded from topic representation analyses was not equal across enthusiasm conditions. For example, only 9.5% of the cases were excluded from the High Enthusiasm/Strategic condition, whereas almost half (i.e., 45.3%) of cases were excluded from the High Enthusiasm/Uniform condition.

Significant differences in the number of topics recalled by each treatment condition may also have influenced results. As noted earlier, participants in the High Enthusiasm/ Strategic condition recalled significantly more topics than participants in the other three conditions. Consequently, these participants had more topics to place into the proper order, which means there was more room for error. For example, participants who recalled only two topics would have only two permutations for correct order, whereas participants who recalled four topics would have 24 permutations for correct order.

In addition to direct effects of teacher enthusiasm on text memory, text memory was also found to mediate the relationship between teacher enthusiasm and student learning in multiple regression analyses. When memory was controlled for, the relationship between teacher enthusiasm and student learning changed significantly. The finding that text memory was the only variable found to mediate the relationship between teacher enthusiasm and student learning makes perfect sense.

Despite equal levels of attention, the three High Enthusiasm conditions differed significantly on memory measures and multiple choice test scores. The consistency in results between group comparison tests and multiple regression analyses provides converging evidence for the text memory model.

Another issue addressed in this study was the question of exactly how teacher enthusiasm influences text memory. Lorch and his colleagues (e.g., Lorch & Lorch, 1996; Lorch, Lorch, & Lorch, Klusewitz, 1995) suggested two ways in which signaling could improve text memory. The attention hypothesis proposes that the selective effects of signaling on text memory are mediated by attention. In other words, memory for signaled content improves because readers pay more attention to signaled than to unsignaled content. Alternatively, the tagging hypothesis proposes that signaled content is "tagged" in memory as particularly important, and therefore, signaled content is more accessible at retrieval than unsignaled content. This second hypothesis is similar to the editing and output interference mechanisms described earlier.

The present results tend to support the attention hypothesis rather than the tagging hypothesis. Within-group analyses of secondary task reaction times indicated that participants were more attentive during high levels of teacher enthusiasm than during lower levels. These results suggest that teacher enthusiasm facilitates text memory because it increases attention to important information. However, increased

attention to signaled content is not necessarily the only reason teacher enthusiasm facilitates text memory. As noted by Lorch et al. (1993) "the tagging hypothesis is not incompatible with the selective attention hypothesis; the additional attention paid to signaled content could consist of tagging the information as important" (p. 53).

Interaction between Motivation, Attention, and Memory Models

Figure 5 outlines the possible interaction between the motivation, attention, and memory models of teacher enthusiasm. Teacher enthusiasm was found to have direct effects on both selective attention and text memory, while the effects of teacher enthusiasm on student motivation were inconclusive. It may be the case that student motivation is an epiphenomenon that occurs in the vicinity of teacher enthusiasm and student learning, but is not causally related to either. This model still accounts for the relationship between teacher enthusiasm and student motivation found in earlier research. However, it suggests that teacher enthusiasm and student motivation are not causally related, instead, student motivation may be a by-product of either improved memory encoding and/or learning of the lecture material. As seen in Figure 5, text memory was the only variable found to significantly mediate the relationship between teacher enthusiasm and student learning. There is also evidence that teacher enthusiasm influenced text memory indirectly by way of student attention. More specifically, the signaling effects of teacher enthusiasm on text memory were found to be mediated by attention. Students were more attentive during high levels of

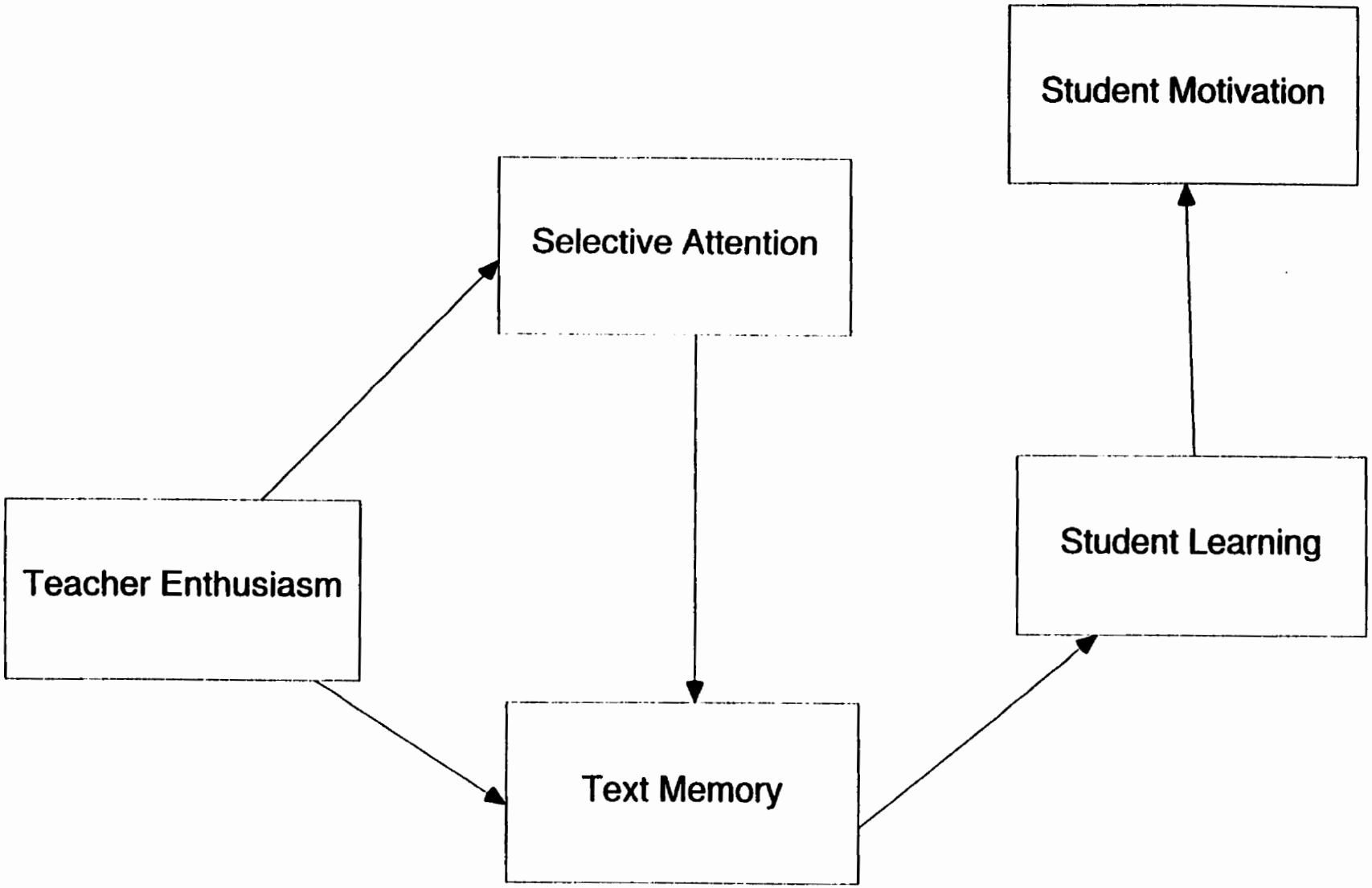

Figure 5
Interaction between Motivation, Attention, & Memory Models

enthusiastic teaching behaviors than during lower levels.

Limitations of this Study

Several limitations of the present study are recognized. As noted by Perry, Abrami, and Leventhal (1979), even though laboratory manipulations of teacher enthusiasm reduce threats to internal validity, they also reduce generalizability of results to real-world classroom environments. For example, the "simulated" classroom used in the present study is more representative of large classes with minimal student-teacher interaction than of small, discussion-based seminar classes.

Secondly, the teaching style used in the High Enthusiasm/Uniform condition was probably not representative of the "average" university professor. Instructors are rarely as energetic and excited about their lectures as the instructor in the High Enthusiasm/Uniform condition. The artificiality of this condition may have affected subject acceptance of the instructor as a university teacher. As a result, High Enthusiasm/ Uniform participants may have put less effort than the other participants into the multiple choice test and free recall tasks.

Since the instructor had difficulty memorizing the entire lecture script in the three High Enthusiasm conditions, it was necessary to use cue cards placed behind the camera (i.e., in front of the instructor). These cue cards may have reduced the authenticity of the teaching situation to an extent. Subjects often remarked on the instructor's tendency to read from cue cards (i.e., "She's reading, isn't she?"). It is

important to note that use of cue cards was not limited to one condition, as the instructor periodically read from cue cards in all three High Enthusiasm conditions.

Another limitation of the present study was the "spill over" effect of strategic enthusiasm. As noted in the pilot study, strategic enthusiasm produced greater perceived clarity and pacing of speech, presumably due to stressing of important points by pausing and gesturing, etc. Consequently, it is possible that group differences in student learning resulted in part from speech behaviors, rather than, or in addition to, teacher enthusiasm.

Implications for Teacher Enthusiasm Research

The results of the study suggest that high levels of teacher enthusiasm are not enough to guarantee learning. In order to have a significant affect on learning, enthusiastic teaching behaviors must be strategic and coincide with the topic structure of a lecture. These results demonstrate that teacher enthusiasm is not just a "song and dance", as originally proposed in the Dr. Fox studies (e.g.,Naftulin, Ware, & Donnelly, 1973). When used strategically, teacher enthusiasm had a significant impact on the cognitive processes of students.

This research has important implications for the instructional development of university professors. In addition to improving effective teaching behaviors, faculty development programs should focus on the interaction between teaching style and lecture content. Results suggest that the meaning of lecture can be conveyed by using

teaching behaviors to emphasize important aspects of lecture content. Strategic use of enthusiasm was the only type of enthusiasm found to facilitate topic recall and student learning. Therefore, instructors should determine the topic structure of their lectures ahead of time, and then use enthusiastic teaching behaviors to highlight main points of a lesson. Pausing and speaking more expressively at the beginning of new topics will help draw student attention to the importance of the lecture material.

Suggestions for Future Research

Additional research needs to be conducted to further substantiate obtained results of the present study. In order to confirm the generalizability of obtained findings, future studies should be conducted in actual classrooms. A field experiment could use the same paradigm as the present study. For example, an instructor could present one topic with strategic enthusiasm with all important points coordinating with high levels of enthusiasm and a second topic with random enthusiasm with only some of the important points coordinating with high levels of enthusiasm. Student performance could be compared for exam questions pertaining to material taught with strategic enthusiasm vs. random enthusiasm.

Future research should also include observational studies of strategic enthusiasm. Past observational studies have examined the frequency of occurrence of enthusiastic teaching behaviors (e.g., Murray, 1983b). Future studies should include a measure of how these enthusiastic teaching behaviors are used. The "degree

of connectedness" measure used in the pilot study to test the manipulation of strategic enthusiasm could also be used in actual classrooms. In addition to differences in the quantity of teacher enthusiasm, do instructors also differ in their extent that they coordinate their level of enthusiasm to the main points of the lesson? Do students of instructors who use teacher enthusiasm to reinforce the meaning of the lecture learn more than students of instructors who use enthusiasm in a random, haphazard way?

Summary and Conclusions

The present study is unique to teacher enthusiasm research because it was the first study to include both quantitative and qualitative differences in teacher enthusiasm. Teacher enthusiasm was defined by both the level (e.g., high vs. low) and type (e.g., Strategic vs. Random vs. Uniform) of enthusiastic teaching behaviors. The three High Enthusiasm conditions included equal levels of enthusiastic teaching behaviors, however, they differed in their coordination of these behaviors with the topic structure of the lecture. This expanded definition of teacher enthusiasm permitted a unique set of hypotheses.

A second important contribution of this study was its use of direct measures of student attention, motivation, and memory encoding in relation to teacher enthusiasm. Whereas previous researchers have often speculated about student attention, motivation, and memory as mediators in the relationship between teacher enthusiasm and student learning, these variables were measured directly in the present

study, and each variable was measured by at least two alternative scales or procedures.

A third important contribution of this study was the addition of a within-group measure of attention. Previous research has adopted a between group model of selective attention where on-task behavior is compared across groups. The present study is the first study to examine within-lecture variation in selective attention. Including secondary task reaction time as an additional measure of selective allowed this novel investigation of selective attention.

In summary, results suggest that teacher enthusiasm has direct affects on student motivation, attention and text memory. However, in order for teacher enthusiasm to improve memory and learning, it must be strategic. This conclusion is based on the finding that teacher enthusiasm facilitated learning only when it strategically emphasized important points in the lecture. Furthermore, text memory was the only variable found to mediate the relationship between teacher enthusiasm and student learning. Results also indicated that that the signaling effects of teacher enthusiasm on text memory were mediated by selective attention. Students were more attentive during high levels of enthusiastic teaching behaviors than during lower levels.

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Appendix A

Main Study: Participant Consent Form

Research Consent Form

I, _____, agree to participate in Andrea Wood's research project. I understand that my participation involves: (1) watching a 16-minute videotaped lecture, (2) pressing a button every time I hear a tone, (3) rating the quality of the videotaped lecture, (4) filling out a 5-item interest survey, (4) completing a free recall test, and (5) completing a 15-item multiple choice test. I understand the amount of time involved in the study is approximately 50 minutes and that I will receive one credit for participating.

I also realize that I am free to withdraw from the study at any time, without loss of promised credit, and that any information obtained as a result of my participation in this experiment will remain strictly confidential, and will not be revealed without my written permission.

_____ _____

Date Signature

Appendix B

Main Study: Introductory Instructions

Instructions

The purpose of this study is to investigate factors contributing to effective classroom teaching in universities. You will be viewing a videotaped lecture, approximately 15 minutes in length, presented by Professor Mary Dow of the Faculty of Education. The experiment will last approximately 50 minutes in total. Your attention and cooperation will be much appreciated.

(1) Please clear your desks, and do **not** take notes during the lecture.

(2) A tone will sound periodically throughout the lecture. Press the button on your desk every time you hear the tone.

(3) Following the videotaped lecture, you will be asked to recall as many points as you can from the lecture.

(4) You will also be asked to complete a multiple choice test on the lecture, rate the effectiveness of the instructor, and complete a 5-item interest survey.

Are there any questions before we begin?

Appendix C

Main Study: Debriefing Form

Debriefing Form

The Effects of Teacher Enthusiasm on Student Motivation, Selective Attention, and Text Memory

Research has consistently shown an association between enthusiastic teaching behaviours and student learning (Murray, 1985). However, few studies have directly examined the cognitive processes that mediate between teacher enthusiasm and student achievement. The goal of the present research is to determine the cognitive mechanisms underlying the effects of teacher enthusiasm.

It has been suggested that teacher enthusiasm facilitates achievement because it increases motivation for learning beyond the classroom. Murray (1983) examined the relationship between low-inference teaching behaviours and student motivation in a multi-section introductory psychology course. Student motivation was measured by amount of studying and by senior course registration. A significant correlation was found between teacher enthusiasm and senior course registration. Students of enthusiastic teachers were more likely to register in senior psychology courses than students of unenthusiastic teachers.

A second explanation for the effects of enthusiastic teaching behaviours on student learning is that such behaviors serve an attention-getting role in the classroom. Murray (1991) proposed that "if a stimulus is unchanging and predictable, we tend to stop paying attention to it" (p. 148). Consequently, students are more likely to attend to teachers who "speak expressively or emphatically", "show facial expressions", and "make eye contact" than to teachers who "read lecture verbatim from prepared notes". Since the lecture format of enthusiastic teachers is more dynamic and less monotonous than the lecture format of unenthusiastic teachers, students are less likely to "tune-out" expressive teachers.

A third hypothesis proposes that enthusiastic behaviors facilitate learning because they emphasize the structure of the lesson, which in turn is expected to aid in the encoding and retrieval of text. Enthusiastic teaching behaviours are proposed to signal students regarding important information in oral text in the same way that headings signal readers regarding important information in written text. The variability in behavior does not occur at random, instead enthusiastic teachers are assumed to coordinate their gestures with the structure of the lesson. For example, enthusiastic teachers may emphasize important points by raising their voice or waving their hands. This coordination between enthusiastic teaching behaviours and the format of the lesson is expected to cue students to important points, which in turn, would aid the encoding and retrieval of that information.

The study in which you just participated is designed to test which of these hypotheses are valid. Thank you for your participation.

Murray, H. G. (1983). Low-inference classroom teaching behaviors in relation to six measures of college teaching effectiveness. In J. G. Donald (ed.), Proceedings of the conference on the evaluation and improvement of university teaching: The Canadian experience. Montreal: Centre for Teaching and Learning Services, McGill University.

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Any further questions that you have about the research, other than questions pertaining to the data collected from other subjects, may be addressed to the principal investigator or her advisor.

Principal Investigator: Andrea Wood
SSC 7309 (wood2@sscl.uwo.ca)

Faculty Advisor: Dr. Harry G. Murray
SSC 6302 (661-2067)

Appendix D

Text of Videotaped Lecture

A Schema Theory of Reading Comprehension

How do readers decipher the meaning of a text? When you are reading a story, how do you figure out what it means? Today's lecture will describe a theory of reading comprehension called: Schema Theory.

The lecture is divided into 3 sections. The first section will provide an overview of schema theory, including: (1) the definition of schemata, and (2) examples of schemata. The second section will describe the role of schemata in reading comprehension. Finally, the last section will illustrate direct applications of schema theory in the classroom.

Schema theory proposes that the meaning of reading materials is constructed by readers themselves. Meaning is based on: (1) new information, (2) prior knowledge, and (3) the way in which readers interact with new information.

Schema theory proposes that readers use their "memory" to help them understand written text. According to schema theory, knowledge is organized into complex representations called "schemata".

Section One: What are Schemata?

What are schemata? Schemata are knowledge structures in memory. They contain elements of related information. They also provide plans for gathering

future information. You have a schema for cars. A schema for boats. A schema for planes. Your schema for cars contains everything you know about cars. Cars have four wheels, a steering wheel, and four doors. Every time you learn something new about cars, you add it to your "car" schema.

Don't be confused by the words schema and schemata. They are the same thing. Schema is the singular, schemata is plural.

A schema contains "slots"which hold the contents of memory as a range of slot values. Your schema for cars contains "wheels", "driver" etc. in its slots. A schema is "activated" when enough of the "slot values" are encountered. Thus, one's schema for "cars" may be activated by reading a passage in which one of the "slot values" is present. This may include the presence of a driver, a four doors, and a steering wheel. Once a schema is activated, it guides our interpretation of the text. Readers who activate their "car" schema would interpret the text differently from readers who activate their "plane" schema.

I am going to tell you a story which illustrates how our "schemas" affect our interpretation of text. As you listen, decide "who" or "what" Tony is.

Tony got up slowly from the mat, planning his escape. He hesitated a moment and thought. Things were not going well. What bothered him most was being held, especially since the charge against him had been weak. He

considered his present situation. The lock that held him was strong, but he thought he could break it. He knew, however, that his timing would have to be perfect. Tony was aware that it was because of his early roughness that he had been penalized so severely--much too severely from his point of view. The situation was becoming frustrating; the pressure had been grinding on him for too long. He was being ridden unmercifully. Tony was getting angry now. He felt he was ready to make his move. He knew that his success or failure would depend on what he did in the next few seconds.

Who is Tony? What does he do? Most people think Tony is a prisoner in a jail. There are enough segments in the paragraph that match up with people's "prisoner" schema. *"Tony got up slowly from the mat, planning his escape"*. On the other hand, you may have decided that Tony was a "wrestler"! There are several elements in the paragraph that also fit the "wrestler" schema. *"The lock that held him was strong, but he thought he could break it"*.

The meanings readers construct for passages depend on the specific schema activated during reading. These constructed meanings determine a great deal about what readers remember. If we were to test your memory for the "Tony" passage, we would find large differences between those people who decided Tony was a wrestler, and those who decided Tony was a prisoner.

Section II: Schemata's Role in Reading Comprehension

Now that I have finished discussing what "schema" are. I will begin describe the role of "schemata"in reading comprehension. Think back to the

definition of schemata. *Schemata are knowledge structures in memory. They contain elements of related information. You have a schema for cars. A schema for boats. Your schema for cars contains everything you know about cars.*

Schemata have at least six important functions in reading comprehension. Schemata: (1) provide a knowledge base, (2) guide attention, (3) help the reader draw inferences, (4) facilitate memory searches, (5) enhance editing of content and (6) help reconstruction. Each function will now be discussed in more detail.

Schemata provide a knowledge base for assimilating new information. This first function is illustrated by the "Tony" passage. New information about "Tony" is integrated into what we already know about "prisoners"or "wrestling" (depending on the schema that was activated). The new information that you are learning today is being integrated into what you already know about reading comprehension.

The second function of schemata is the focusing of attention during reading. Consider the "Tony" passage once again. If you gave some people the "Tony" passage with the title "The Wrestler", while giving others the same passage with the title "The Prisoner". You would see large differences in the

way the two groups would attend to different parts of the passage. Readers who thought "Tony" was a prisoner would attend to sections of the passage which supported the prisoner schema (e.g., *"planning his escape")*. While readers who thought "Tony" was a wrestler would attend to different parts of the passage (e.g., *"Tony got up slowly from the mat")* .

Thirdly, schemata enable readers to draw inferences about the text. Drawing inferences requires the generation of knowledge not given in a text. Consider the following passage:

The girl sat looking at her piggybank. "Old friend", she thought "this hurts me." A tear rolled down her cheek. She hesitated, then picked up her tap shoe by the toe and raised her arm. Crash! Pieces of Piggo--that was its name--rained in all directions. She closed her eyes for a moment to block out the sight.

This passage is about a girl breaking open a piggybank. This passage did not state what Piggo was made of, what Piggo looked like, or what size Piggo was. Your schema of piggybanks, however, lets you infer these things and construct a more complete meaning for the passage.

Consider the fourth function of schemata in reading comprehension: The "scaffolding" nature of schemata facilitates organized searches of memory. Memory searches are restricted to schemata activated during reading. Therefore, only the information in memory most relevant to the reading

passage is readily available.

For example, if you are reading a passage about a ship's christening, the schema for "ship christening" restricts the memory search to related instances of knowledge. The reader asks himself "What kind of bottle is usually broken over the ship" "Where do they break the bottle on the ship".

The fifth function of schemata in reading comprehension is the editing of content. Reading is guided by a reader's schemata. Therefore, new information is constantly integrated into existing schemata. This integration between new and old information allows readers to edit new information efficiently. Editing may involve determining that some content has already been mastered (e.g., "I know this stuff; I'll speed up until I see something new"). Editing may also involve marking certain segments of a passage as particularly important (e.g., "This section will probably be on the exam).

Finally, schemata permit the reconstruction of content. Readers have a difficult time remembering an entire passage word for word. Instead, most readers remember the "gist" of a passage. The form of a passage is reconstructed on the basis of other knowledge. For example, if you were asked to recall the "Piggo" passage. You would probably do a good job of describing a girl's destruction of a piggy bank. This is the "gist" of the story. It is also

very likely that you would use your "piggybank" schema to reconstruct the story. You would have a difficult time reconstructing the story verbatim.

Section III: Schema Theory in the Classroom

The final section of the lecture will illustrate how schema theory can be used in the classroom.

As stated earlier: Schema theory proposes that the meaning of reading materials is constructed by readers themselves. Meaning is based on: (1) new information, (2) prior knowledge, and (3) the way in which readers interact with new information.

Schema theory also proposes that reading comprehension improves when new information is related to what readers already know. Advance organizers and schema activation are techniques designed to facilitate reading comprehension. These techniques relate the to-be-learned information to what readers already know.

Advance Organizers

The purpose of advance organizers is to relate new information to what readers already know. Advance organizers are "introductory materials introduced in advance of learning". The "idea" of advance organizers makes "intuitive" sense. Anything that can serve to relate new information to what

readers already know should be valuable.

Early research on advance organizers seemed especially promising. In 1961, Ausubel and Fitzgerald compared the effects of 3 types of advance organizers on student learning. Subjects read one of three advance organizers prior to reading a passage on Buddhism. One-third of the subjects read a historical introduction prior to reading the Buddhism passage. In the second condition, the principles of Buddhism were explained in abstract and general terms. The third advance organizer related what the students already knew about religion to the new material on Buddhism. The results were clear. On the posttest, students who read the advance organizer relating Christianity to Buddhism outperformed students in the other 2 conditions.

Although Ausubel's research continued to support the effectiveness of advance organizers. Many other researchers did not. By the 1970's, research on advance organizers was a jumbled mass of results--both pro & con.

Why did some studies support the use of advance organizers, while others did not? Careful reviews of advance organizer research identified problems in the research. The main problem with the research was the definition of advance organizers. The definition of advance organizer was so vague that there was no consistency among studies. Advance organizers ranged from

outlines to questions to pictures to graphs to paragraphs.

Recently, a series of studies has identified the characteristics of good advance organizers. In general, organizers that: (1) give readers an analogy for an upcoming event, (2) are concrete, and (3) use concrete examples are superior to advance organizers that are: (1) abstract, (2) general, and (3) poorly learned.

In sum, the concept of advance organizers is theoretically appealing. If properly developed, advance organizers are effective devices for enhancing readers' comprehension of text. A closely related idea, schema activation, has not received as much research attention.

Schema Activation

Schema activation refers to activities designed to activate relevant background knowledge prior to encountering new information. Examples of schema activation include:(1) having students answer questions related to an upcoming topic, (2) reviewing previous learning, (3) developing a "schema map" of related knowledge already in memory.

Schema activation techniques attempt to accomplish the goal of advance organizers (e.g., relating new to already known information), without providing written materials in advance of learning. Instead, the emphasis is on

helping students recall information that they already know that is related to the new topic. Advance organizers use only one method to accomplish this task--by providing written materials ahead of time. While, schema activation techniques use a number of techniques to accomplish this task.

The following study illustrates the use of schema activation in the classroom. Fifth grade students read a fictional story about foxes. Prior to reading, half the students activated relevant prior knowledge. These students told the teacher what they knew about foxes. The remaining half, activated information that was not relevant to the fox story. These students told the teacher what they knew about American Farms. Test results supported schema activation. Students who had activated knowledge about "foxes" remembered more about the "fox" passage than students who had discussed "farms".

Summary & Applications of Schema Theory

In summary, Schema theory holds that the meaning of materials is constructed by readers. A reader's understanding of written text is based on: (1) new information, (2)existing knowledge (i.e., schema), and (3) the way in which you interact with new information.

Schema activation and advance organizers are designed to facilitate a reader's understanding of written text. These two techniques facilitate reading

comprehension & text memory by: relating new information to what readers already know.

Appendix E

Topic Structure of Videotaped Lecture

Topic Structure of the "Schema Theory" Lecture

1. Schema Theory Introduction

Section I: What are Schemata?

2. Definition of Schemata

3. Activation of Schemata

4. Interpretation of Text

5. Text meaning constructed by readers

Section II: Schemata's Role in Reading Comprehension

6. Knowledge Base

7. Focusing of Attention

8. Drawing Inferences

9. Organized Searches of Memory

10. Editing of Content

11. Reconstruction of Content

Section III: Schema Theory in the Classroom

12. Advance Organizers: Definition

13. Advance Organizer Research: Buddhism Study

14. Problems with Advance Organizer Research

15. Characteristics of Good Advance Organizers

16. Schema Activation: Definition & Examples

17. Schema Activation Research: Fox Study

Appendix F

Examples of High and Low

Topic Level Propositions

The fifth function of schemata in reading comprehension is the editing of content. Reading is guided by a reader's schemata. Therefore, new information is constantly integrated into existing schemata. This integration between new and old information allows readers to edit new information efficiently. *Editing may involve determining that some content has already been mastered (e.g., "I know this stuff; I'll speed up until I see something new"). Editing may also involve marking certain segments of a passage as particularly important (e.g., "This section will probably be on the exam).*

Bold face=High Topic Level Propositions

Italics=Low Topic Level Propositions

Appendix G

Signaled versus Unsignaled Topics in the Random Condition

1. **Schema Theory Introduction**

2. *Definition of Schemata*

3. *Activation of Schemata*

4. *Interpretation of Text*

5. *Text meaning constructed by readers*

6. *Knowledge Base*

7. *Focusing of Attention*

8. **Drawing Inferences**

9. **Organized Searches of Memory**

10. *Editing of Content*

11. *Reconstruction of Content*

12. *Advance Organizers: Definition*

13. *Advance Organizer Research: Buddhism Study*

14. **Problems with Advance Organizer Research**

15. **Characteristics of Good Advance Organizers**

16. **Schema Activation: Definition & Examples**

17. **Schema Activation Research: Fox Study**

Bold Face=Signaled Topics

Italics=Unsignaled Topics

Appendix H

On-Task Behaviour Recording Form

Time-on-Task: Every 60 seconds, record which students are on-task and which students are off-task

Recording Interval

Subject	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

Appendix I

Secondary Task Reaction Time (STRT)

Recording Form

Secondary Task Reaction Time (STRT) in milliseconds

Tones

Subject	1 0:55	2 1:43	3 2:20	4 3:03	5 4:53	6 5:38	7 6:47	8 7:18	9 8:17	10 8:35
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Tones

Subject	11 9:33	12 9:54	13 10:14	14 10:53	15 11:42	16 12:16	17 12:34	18 13:42	19 14:32	20 14:59
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Appendix J

Master List of Topics and Core Propositions

Master List

1. Schema Theory Introduction

1) Schema theory proposes that the meaning of reading materials is constructed by readers themselves.
2) Meaning is based on new information.
3) Meaning is based on prior knowledge.
4) Meaning is based on the way in which readers interact with new information.
5) Schema theory proposes that readers use their "memory" to help them understand written text.
6) According to schema theory, knowledge is organized into complex representations called "schemata".

Section One: What are Schemata?

2. Definition of Schemata

7) Schemata are knowledge structures in memory.
8) Schemata contain elements of related information.
9) Schemata provide plans for gathering future information.
10) You have a schema for cars.
11) A schema for boats.
12) A schema for planes.
13) Your schema for cars contains everything you know about cars.
14) Cars have four wheels, a steering wheel, and four doors.
15) Every time you learn something new about cars, you add it to your "car" schema.
16) Schema and schemata are the same thing.
17) Schema is singular and schemata is plural.

3. Activation of Schemata

18) A schema contains "slots".
19) Slots hold contents of memory as a range of slot values.
20) Your schema for cars contains "wheels"and "driver" in its slots.
21) A schema is "activated" when enough **"slot values"** are encountered.
22) Schema for "cars" may be activated by reading a passage in which one of the "slot values" is present.
23) This may include the presence of a driver, four doors, and steering wheel.

4. Interpretation of Text

24) Activated schemas guide our interpretation of the text.
25) Readers who activate "car" schema interpret text differently from readers who activate "plane" schema.
26) "Tony" story illustrates how "schemas" affect our interpretation of text.
27) Most people think Tony is a prisoner in a jail.
28) Segments of the paragraph match up with people's "prisoner"schema. "
29) For example, *"Tony got up slowly from the mat, planning his escape"*.
30) On the other hand, you may have decided that Tony was a "wrestler".
31) Several elements in the paragraph also fit the "wrestler" schema.
32) For example, *"The lock that held him was strong, but he thought he could break it"*.

5. Text meaning constructed by readers

33) Meaning of text depends on specific schema activated during reading.
34) Constructed meanings determine what readers remember.
35) If you were to test readers memory for the "Tony" passage.
36) You would find large differences between those people who decided Tony was a wrestler and those who decided Tony was a prisoner.

Section II: Schemata's Role in Reading Comprehension

6. Knowledge Base

37) Schemata provide a knowledge base for assimilating new information.
38) This first function is illustrated by the "Tony" passage.
39) New information about "Tony" is integrated into what we already know about "prisoners"or "wrestling".
40) Integration depends on the schema that was activated.
41) New information that you are learning today is being integrated into what you already know about reading comprehension.

7. Focusing of Attention

42) The second function of schemata is the focusing of attention during reading.
43) Consider the "Tony" passage once again.
44) If you gave some people the "Tony" passage with the title "The Wrestler" and gave others the same passage with the title "The Prisoner".
45) You would see large differences in the way the two groups would attend to different parts of the passage.
46) Readers who thought "Tony" was a prisoner would attend to sections of the passage which supported the prisoner schema.
47) While readers who thought "Tony" was a wrestler would attend to different parts of the passage.

8. Drawing Inferences

48) Thirdly, schemata enable readers to draw inferences about the text.
49) Drawing inferences requires the generation of knowledge not given in a text.
50) The Piggo passage is about a girl breaking open a piggybank.
51) This passage did not state what Piggo was made of, what Piggo looked like, or what size Piggo was.
52) Your **schema** of piggybanks lets you **infer** these things.
53) And construct a more **complete** meaning for the passage.

9. Organized Searches of Memory

54) Scaffolding of schemata facilitates organized searches of memory.
55) Memory searches are restricted to schemata activated during reading.
56) Only the information in memory most relevant to the reading passage is readily available.
57) If you are reading a passage about a ship's christening, the schema for "ship christening" restricts the memory search to related instances of knowledge.
58) The reader asks himself "What kind of bottle is usually broken over the ship?"
59) The reader asks himself "Where do they break the bottle on the ship"?.

10. Editing of Content

60) The fifth function is the editing of content.
61) Reading is guided by a reader's schemata.
62) New information is constantly integrated into existing (old) schemata.
63) This integration between old & new allows readers to edit new information efficiently.
64) Editing may involve determining that some content has already been mastered.
65) For example, "I know this stuff; I'll speed up until I see something new".
66) Editing may also involve marking certain segments of a passage as important
67) For example, "This section will probably be on the exam".

11. Reconstruction of Content

68) Schemata permit the reconstruction of content.
69) Readers have a difficult time remembering an entire passage word for word.
70) Instead, most readers remember the "gist" of a passage.
71) The form of a passage is reconstructed on the basis of other knowledge.
72) For example, if you were asked to recall the "Piggo" passage.
73) You would probably do a good job of describing a girl's destruction of a piggy bank.
74) This is the "gist" of the story.
75) It is also very likely that you would use your "piggybank" schema to reconstruct the story.
76) You would have a difficult time reconstructing the story verbatim.

Section III: Schema Theory in the Classroom

12. Advance Organizers: Definition

77) Final section illustrates how schema theory can be used in the classroom.
78) The purpose of advance organizers is to relate new information to what readers already know.
79) Advance organizers are "introductory materials introduced in advance of learning".
80) The "idea" of advance organizers makes "intuitive" sense.
81) Anything that relates **new information** to what readers **already know** is valuable.

13. Advance Organizer Research: Buddhism Study

82) Early research on advance organizers seemed especially promising.
83) Ausubel and Fitzgerald conducted a study in 1961.
84) They compared the effects of 3 types of advance organizers on student learning.
85) Subjects read one of 3 advance organizers before reading a passage on Buddhism.
86) One-third of the subjects read a historical introduction.
87) The second advance organizer explained Buddhism in abstract and general terms.
88) The third advance organizer related what the students already knew about religion to the new material on Buddhism.
89) The results were clear.
90) On the posttest, students who read the advance organizer relating Christianity to Buddhism outperformed students in the other 2 conditions.

14. Problems with Advance Organizer Research

91) Although, Ausubel's research continued to support the effectiveness of advance organizers.
92) The research of many others did not.
93) By the 1970's, research on advance organizers was a jumbled mass of results.
94) Results were both pro & con.
95) Why did some studies support the use of advance organizers?
96) Why did some studies NOT support the use of advance organizers?
97) Careful reviews of advance organizer research identified problems in the research.
98) The main problem with the research was the **definition** of advance organizers.
99) The definition of advance organizer was so vague.
100) There was no consistency among studies.
101) Advance organizers ranged from outlines to questions to pictures to graphs to paragraphs.

15. Characteristics of Good Advance Organizers

102) Recently, a series of studies has identified the characteristics of good advance organizers.
103) Good organizers give readers an analogy for an upcoming event
104) Good organizers are concrete.
105) Good organizers use concrete examples.
106) Poor organizers are abstract.
107) Poor organizers are general.
108) Poor organizers are poorly learned.

16. Schema Activation: Definition & Examples

109) Schema activation refers to activities designed to activate relevant background knowledge prior to encountering new information.
110) An example of schema activation is: having students answer questions related to an upcoming topic
111) An example of schema activation is: reviewing previous learning,
112) An example of schema activation is: developing a "schema map" of related knowledge already in memory.
113) Schema activation techniques attempt to accomplish the goal of advance organizers.
114) The goal of advance organizers is relating new to already known information.
115) Without providing written materials in advance of learning.
116) Instead, the emphasis is on helping students recall information that they already know that is related to the new topic.
117) Advance organizers use only one method to accomplish this task.
118) Providing written materials ahead of time.
119) Schema activation techniques use a number of techniques to accomplish this task.

17. Schema Activation Research: Fox Study

120) The following study illustrates the use of schema activation in the classroom.
121) Fifth grade students read a fictional story about foxes.
122) Prior to reading, half the students activated relevant prior knowledge.
123) These students told the teacher what they knew about foxes.
124) The remaining half, activated information that was not relevant to the fox story.
125) These students told the teacher what they knew about American Farms.
126) Test results supported schema activation.
127) Students who had activated knowledge about "foxes" remembered more about the "fox" passage than students who had discussed "farms".

Appendix K

Multiple Choice Test

Multiple-Choice Test

1. According to schema theory, the meaning of this test question is constructed by:

   a. the author of the test question
   b. the videotaped instructor
   c. the test-taker
   d. the author of the test question and the test-taker

2. Which of the following is **not** a characteristic of schemata:

   a. Schemata contain elements of related information.
   b. Schemata are rules about what actions to take, given certain conditions.
   c. Schemata provide plans for gathering future information.
   d. Schemata are knowledge structures in memory.

3. Two groups of students read the same story describing two brothers skipping school and staying at home. One group was told to read the story from the perspective of a potential home buyer, while the second group was told to read the story from the perspective of a burglar. The results of the study showed that the information recalled was strongly influenced by the perspective taken. Of the many functions that schemata serve in reading comprehension, which function does this study best illustrate?

   a. editing and summarizing of content
   b. focusing of attention during reading
   c. facilitation of organized searches of memory
   d. reconstruction of story content

4. When you read the sentence *"Erin borrowed the antique tablecloth"*, you know more about the sentence than what is being explicitly stated. How is this possible?

   a. schemata influence the interpretation of a sentence
   b. new information is added to existing schemata
   c. schemata enable readers to draw inferences about text
   d. schemata are templates for information we already know

5. A schema is activated when enough of its _____ are encountered.

   a. slot values
   b. facts
   c. slots
   d. default values

6. The videotaped instructor told a story about "Tony". Who was "Tony"?

   a. a prisoner
   b. a wrestler
   c. a delivery boy for Mr. Pizza
   d. either (a) or (b) depending on schema activation

7. According to schema theory, which of the following factors do **not** influence a reader's understanding of written text:

   a. prior knowledge
   b. the author's perspective
   c. the way in which readers interact with new information
   d. new information

8. Which of the following is **true** regarding the role of schemata in the reconstruction of reading material?

   a. the body of a reading passage is recreated on the basis of existing knowledge
   b. schemata enable readers to recall the exact words of a reading passage
   c. comprehension is enhanced by activating relevant schemata
   d. all of the above

9. A group of students were asked to recall what they knew about "ship christenings". Which of the following recall protocols prove that schemata facilitate organized searches of memory?

   a. Love Boat, broken bottle, Caribbean
   b. baby, religious ceremony, one year old
   c. huge, Bon Voyage, metal
   d. champagne, broken bottle, side of ship

10. While reading a textbook chapter on "Personality Disorders", Joe realized that he had already learned the sections on "Schizophrenia" and "Depression". Consequently, he sped up his reading until he encountered something new. Of the many functions that schemata serve in reading comprehension, which function does this example best illustrate?

    a. interpretation of reading material
    b. summarization of content
    c. editing of content
    d. both (a) and (c)

11. In 1961, Ausubel and Fitgerald compared the effects of 3 types of advance organizers on student learning of a Buddhism passage. Which of the following advance organizers improved student learning the most?

    a. the organizer that described the history of the Buddhist culture
    b. the organizer that described the principles of Buddhism in general terms
    c. the organizer that described the principles of Buddhism in abstract terms
    d. the organizer that related Buddhism to Christianity

12. What was the main problem with early research on advance organizers?

    a. failure to keep track of how long students studied reading passages
    b. ambiguous definition of advance organizers
    c. failure to use true control groups
    d. poorly developed posttests

13. Which of the following advance organizers would have the greatest impact on learning of the videotaped lecture that you just watched?

    a. detailed summary of various theories of reading comprehension
    b. comparison between an average student's reading experiences and schema theory
    c. comparison between "Goodman's Model"of reading comprehension and schema theory
    d. general overview of the schema theory of reading comprehension

14. Which of the following is **not** an example of schema activation techniques?

    a. having students answer questions related to an upcoming topic
    b. reviewing previous learning in class
    c. developing a map of related knowledge already in memory
    d. providing written materials in advance of learning

15. Several students in a Grade 2 class are recent immigrants and have limited knowledge of the kinds of experiences described in the basal reader series (e.g, county fairs, zoos, trips to the beach, shopping malls). The students speak and read English but have difficulty understanding and remembering what they read. What should the teacher do to improve the immigrant students' comprehension of a "shopping mall" story?

    a. help students pick out the main points in the story
    b. arrange a field trip to a shopping mall
    c. send students to the resource room for extra help in reading
    d. compare shopping in a mall to shopping in a farmer's market

Appendix L

Questionnaire assessing Motivation for Further Learning

Motivation for Further Learning

Please use the 5-point rating scale shown below to estimate your degree of interest in the following aspects of the topic of the videotaped lecture:

1	2	3	4	5
Zero Interest	Slightly Interested	Average Interest	Very Interested	Extremely Interested

1. Taking a course that explores the lecture topic in more detail. 1 2 3 4 5

2. Attending a research presentation on the lecture topic. 1 2 3 4 5

3. Reading additional information about the lecture topic. 1 2 3 4 5

4. Writing a required course paper on the lecture topic. 1 2 3 4 5

5. Watching a follow-up video on the lecture topic. 1 2 3 4 5

Appendix M

Student Evaluation of Videotaped Lecture

Evaluation of Videotaped Lecture

Please use the 7-point rating scale shown below to rate the instructor you have just observed teaching the videotaped lecture.

1	2	3	4	5	6	7
Very Poor	Unsatisfactory	Borderline	Satisfactory	Good	Very Good	Outstanding

1.The instructor displayed enthusiasm and energy in conducting the lecture.

1 2 3 4 5 6 7

2.The instructor conducted the lecture in an organized, well planned manner.

1 2 3 4 5 6 7

3. The instructor explained concepts clearly and understandably.

1 2 3 4 5 6 7

4. The instructor presented the lecture material in an interesting way, considering inherent limitations of the subject matter.

1 2 3 4 5 6 7

5. How would you rate the instructor in terms of general, overall effectiveness as a teacher?

1 2 3 4 5 6 7

Appendix N

Teacher Behaviors Inventory

Teacher Behaviors Inventory

Instructions to student

In this inventory you are asked to assess the frequency with which the videotaped instructor exhibits various classroom teaching behaviors. Each section of the inventory begins with a definition of the category of teaching behaviors to be assessed in that section, followed by a list of specific teaching behaviors. Please use the 5-point rating scale shown below to estimate the frequency of occurrence of each of these teaching behaviors for the videotaped instructor.

A	B	C	D	E
Almost Never	**Rarely**	**Sometimes**	**Often**	**Almost Always**

Enter your ratings of the 27 teaching behaviors in columns 1 to 27 of the answer sheet, using a soft lead pencil. Be sure to press firmly, mark only one space per column, and fill in the entire oval-shaped answer space. Try to assess each behavior independently rather than letting your overall impression of the instructor determine each individual setting.

Clarity: teaching behaviors that serve to explain or clarify concepts and principles.

1. gives several examples of each concept

2. uses concrete examples or practical applications to explain concepts

3. fails to define new or unfamiliar terms

4. repeats difficult ideas several times

5. stresses most important points by pausing, speaking slowly, raising voice, etc.

Enthusiasm: use of nonverbal behavior to solicit student attention and interest

6. speaks in a "dramatic" or expressive way

7. moves about while lecturing

8. gestures with hands or arms

9. exhibits facial gestures or expressions

10. avoids eye contact with students

11. tells jokes or humorous anecdotes

12. reads lecture verbatim from prepared notes or text

13. smiles or laughs while teaching

14. shows distracting mannerisms

Pacing: rate of presentation of information, efficient use of class time

15. dwells excessively on obvious points

16. digresses from major theme of the lecture

17. covers too much material in class sessions

Organization: teaching behaviors that serve to structure or organize the subject matter

18. gives preliminary overview of lecture at the beginning

19. puts outline of lecture on blackboard or overhead screen

20. uses headings and subheadings to organize lecture

21. clearly indicates transition from one topic to the next

22. periodically summarizes points previously made

Speech: voice characteristics relevant to classroom teaching

23. stutters, mumbles or slurs words

24. speaks at appropriate volume

25. speaks clearly

26. speaks at appropriate pace

27. says "um" or "ah"

Appendix O

Ratings of Overall Enthusiasm

and Coordinated Enthusiasm

(1) CONTINUE TO USE THE MARKEX SHEET FOR ITEMS 28-31.
(2) PLEASE DO NOT MARK *THIS* SHEET.

---

28. Rate the instructor's **overall** level of enthusiasm.

A	B	C	D	E
Low		Medium		High

29. Rate the extent to which teacher enthusiasm **coordinated** with the main points of the lecture (e.g., teacher enthusiasm increased during main points and decreased during less important points).

A	B	C	D	E
Almost Never	Rarely	Sometimes	Often	Almost Always

30. Rate the extent to which teacher enthusiasm served to **reinforce** the meaning of the lecture (e.g.. helped you understand the lecture).

A	B	C	D	E
Almost Never	Rarely	Sometimes	Often	Almost Always

31. Rate the extent to which the level of teacher enthusiasm was **appropriate** to the points being discussed **within** the lecture.

A	B	C	D	E
Almost Never	Rarely	Sometimes	Often	Almost Always

Appendix P

Pilot Study: Participant Consent Form

Research Consent Form

I, _____, agree to participate in Andrea Wood's research project. I understand that my participation involves watching four 16-minute videotaped lectures. I understand the amount of time involved in the study is approximately 80 minutes and that I will receive two credits for participating.

I also realize that I am free to withdraw from the study at any time, without loss of promised credit, and that any information obtained as a result of my participation in this experiment will remain strictly confidential, and will not be revealed without my written permission.

_____ _____

Date Signature

Appendix Q

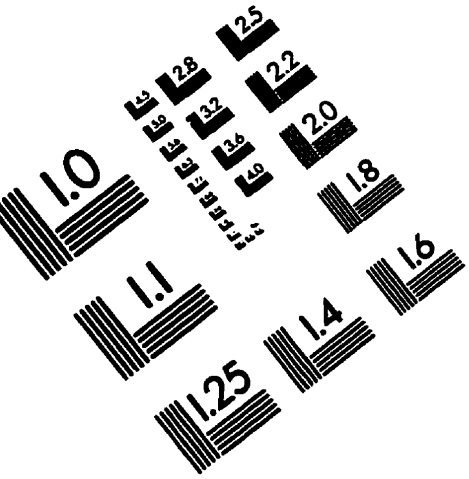
Pilot Study: Introductory Instructions

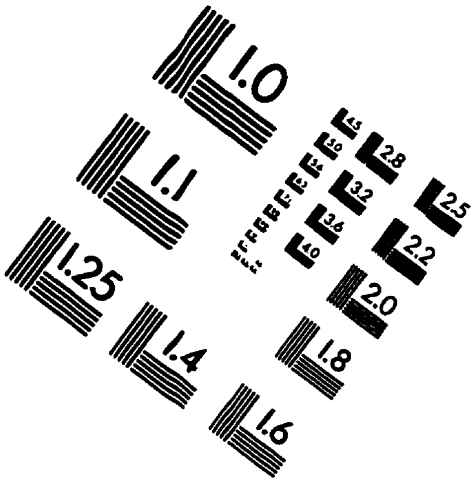
Instructions

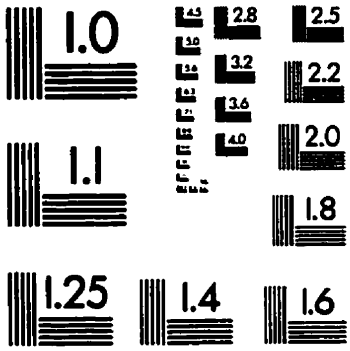
The purpose of this study is to investigate factors contributing to effective classroom teaching in universities. You will be viewing **four** videotaped lectures on the **same topic**. Following each lecture, you will be asked to rate the frequency of specific teaching behaviors. Therefore, pay particular attention to the differences in teaching style between the four videotaped lectures.

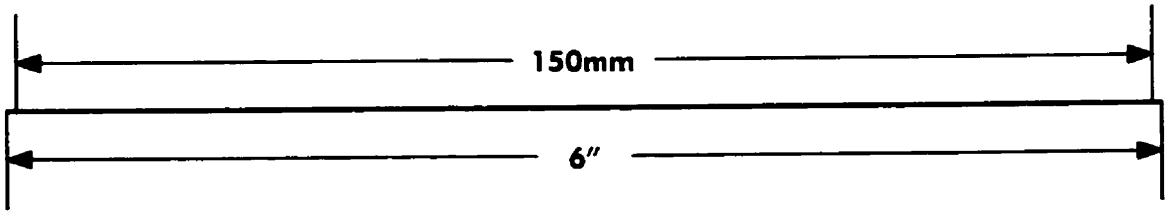
Are there any questions before we begin?

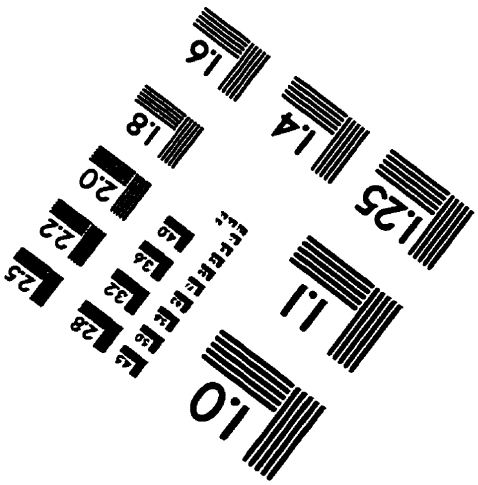
IMAGE EVALUATION
TEST TARGET (QA-3)











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1653 East Main Street
Rochester, NY 14609 USA
Phone: 716/482-0300
Fax: 716/288-5989

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