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An Investigation Of Student Participation And Student-teacher Interaction In The Case Method Classroom

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ABSTRACT

This research investigated the role of student participation and student-teacher interaction in Master of Business Administration classrooms utilizing the case method of teaching. The first goal of the study was to investigate how student characteristics are related to classroom participation and to amount learned in two diverse business courses (i.e. Marketing and Finance). The second goal was to examine the development of problem-solving skills during class participation throughout the academic year and to examine the cognitive congruence between level of teacher question and level of student response.

The 58 first year, Master of Business Administration students were videotaped at three intervals throughout the academic year. The students' responses from the transcribed tapes were analyzed both qualitatively (in terms of problem-solving components and cognitive level) and quantitatively (in terms of frequency and length of time), for each of the three time periods in each course.

As hypothesized, the results of the study suggested that degree type, undergraduate average, and critical thinking skills (as measured by Watson-Glaser) were significant predictors of course grades. For the Finance course, the most important predictor of grades appeared to be having an Engineering degree, whereas for the Marketing course critical thinking skills were the most important predictor. It was found that high cognitive level student responses were a significant predictor of final Finance participation grades.

Over the course of the year, it was found, as postulated, that more low level problem-solving skills were exhibited in Marketing than

Finance. Similarly, more low level teacher questions were asked in Marketing than in Finance. Overall, it was found that as time progressed, students increased in their use of lower level problem-solving skills.

Finally, as hypothesized, there was a strong congruence between the cognitive level of teacher questions and the cognitive level of student responses. It was found that the majority of questions asked in both courses were low level in nature. The results of the present study suggest the case method can be an excellent active learning technique. Several recommendations are offered for improving problem-solving and critical thinking in class discussion.

DEDICATION

This thesis is dedicated with love to: **Avery Dance**, whose wonder of the world helped open my eyes again; to **Vera Dawson**, whose vision of my future set me on the path to university many years ago, and to my dear mother **Mary Forbes**, whose love has been a sustaining force throughout all my years of schooling.

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INTRODUCTION

Since the early 1960's there has been strong interest in educational research on classroom interaction and student participation in classroom discussion (Jansen, Jensen, & Mylov, 1972; Mattsson, 1974). One central reason for this interest is that classroom participation has been found to be critically related to student learning (Comadena & Prusank, 1988; Williams, 1971). Other things being equal, students who ask more questions and are called upon more frequently have higher achievement scores and stronger formal reasoning abilities than nonparticipants (Tobin & Gallagher, 1987). Therefore, it is imperative that educational researchers understand the factors that facilitate student participation within classroom contexts, with the aim of improving student achievement and thinking skills.

Prior research on classroom interaction has seldom focused on the relationship of student characteristics to participation behaviour in the classroom (Tobin & Gallagher, 1987). Very little is known about which student attributes mediate between teacher behaviours and classroom interaction. The few studies that have been performed in this area (e.g., Williams, 1971) suggest that student characteristics are potentially an important factor influencing participation in the classroom. From a review of the literature on classroom participation, several social-cognitive characteristics show particular promise as important predictors of classroom participation. As outlined below, these characteristics include critical thinking skills, self-esteem,

assertiveness, and public speaking anxiety (Tobin & Capie, 1982; Morrison & Thomas, 1974/75; Tobin & Gallagher, 1987; Seitchik, 1981/82). Gender may also be a predictor of classroom participation (Williams, 1990).

Another limitation of previous research on classroom participation is that it has typically focused solely on elementary or secondary school students, with little research examining university students. It is not clear whether student characteristics which influence classroom participation at the elementary and secondary school levels also influence classroom interaction at the university level.

Business Administration classes which utilize the case method are an ideal context for assessing classroom interaction at the university level, because classroom interaction is central to the learning process of this teaching method. Management education, the education of business students to be general managers, typically utilizes the case method of instruction (Sachedeva,1983). Yet no studies have examined classroom interaction in this environment. In the case method, students are presented with a description of a case or situation that has occurred or could occur in a business setting (Paget, 1988). Students are supplied with some facts and figures and then must analyze the situation to determine the most appropriate action to take (Sachedeva, 1983). Once they have performed the case analysis, they must be prepared to defend their opinion in class discussion. Paget (1988) suggests that the case discussion fulfils an important educational objective of allowing students the opportunity to discuss their synthesis of the case information and present their decision for action without the

repercussions that would occur in the real world (Smith, 1987). The sharing of opinion that occurs during group discussion is designed to foster cooperative learning and hopefully leads to the development of critical thinking and problem-solving skills (Smith, 1987). Thus, the ability to participate in class discussion would appear to be vital to the development of critical thinking and decision making skills.

Several social-cognitive attributes have been identified as potentially important predictors of student participation in case method classes. McNair (1954), in one of the definitive books on the case method, describes the ideal case method student as a tough-minded individual, a risk taker who is able to handle criticism, an individual who enjoys speaking out in class, and one who has superior analytical skills. Therefore, it appears that individuals with a high level of self-esteem and assertiveness, good problem-solving or critical thinking ability, and lack of public speaking anxiety, will be more likely to participate in case method discussions. In addition, gender is likely an important determinant of participation in class discussion, based on evidence that from grade school through graduate school that males tend to have higher rates of participation in classes than do females (Sadker & Sadker, 1986; Williams, 1990).

It also appears important to examine the role that teachers play in fostering case discussion. In case method classes, teachers act primarily as facilitators of discussion (Erskine, Leenders, Mauffette-Leenders, 1981). Yet in their role as teachers, they largely guide the direction the case analysis will take. It would seem important to examine critically the nature of the types of questions that teachers

ask in class, because this variable, along with student characteristic variables, is likely to have a significant impact both on the case discussion and on what is learned in class. Research on teacher questions has seldom focused on a teaching method like the case method where discussion is the primary method of teaching (Foster, 1980). More importantly, research on the case method of teaching has never examined how type of teacher questions influences case discussion.

Another potentially important influence on classroom interaction that has not been fully addressed in previous research is the subject matter of the class. Although research has examined classroom interaction in specific academic contexts such as science classrooms (Tobin & Gallagher, 1987), little research has focused explicitly on comparing student participation in different subject areas (Smith,1977). Management education covers a broad range of subjects from the so called "hard" disciplines such as Finance or Accounting to the more "soft" disciplines such as Marketing or Organizational Behaviour. Research on students enroled in a graduate management program (MBA) would allow a specific comparison of how student characteristics are related to classroom participation in diverse subject areas.

As Smith (1977) has pointed out, research in higher education has seldom examined the actual classroom processes that mediate between learner attributes and outcome measures. The present research examined the influence of student characteristics (critical thinking skills, gender, self-esteem, assertiveness, public speaking anxiety) on classroom participation processes in two types of Business classes using the case method (Finance and Marketing). Classroom participation was

studied through analysis of videotaped class sessions over an eight-month period. This research was directed by two primary goals. The first goal was to determine the relationship of student characteristics to both classroom participation and the development of business problem-solving skills, as measured by course grades determined primarily by case analysis exams. The second goal was to examine the progressive development of case method problem-solving skills over the course of the academic year. This second goal was achieved by: (1) analysing the content of student responses in terms of components of the problem-solving process; and (2) examining the congruence between the cognitive level of questions asked by instructors and the cognitive level of student responses.

Review of Literature

The next sections of the introduction will review the pertinent background research on classroom interaction, the case method of instruction, student characteristics, and subject matter. This will be followed by a presentation of the rationale and hypotheses of the present rese .rch.

Classroom Interaction

While many studies have examined the classroom interaction patterns of elementary students, results of studies with younger students may not be applicable to postsecondary students. Blumenfeld and Meece (1985) suggest that at the elementary school level, the primary goal of teacher communication is to coordinate activities and to ensure

that norms of appropriate classroom behaviour are enforced. They suggest that the elementary teacher's role is mainly reactive to classroom events which interfere with ongoing learning activities. However, at the postsecondary school level, the teacher's role as a disciplinarian is likely to be a minor one. One consequence of this focus on the teacher as disciplinarian has been to influence the coding categories developed and utilized by elementary school researchers. Observers minutely coded ways in which teachers kept students on task and employed classroom management techniques.

At the elementary and secondary levels, much of the emphasis on classroom interaction, particularly research on teacher questioning, has been on "teacher wait time" (Tobin & Capie, 1982). Teacher wait time is the amount of time a teacher waits before answering his or her own question. This variable has been found to be positively correlated with student outcome measures, such as achievement, and therefore is the centre of a lot of the research on teacher questioning. However, for reasons outlined below, it seems probable that in some contexts, such as business classes involving the case method of instruction, teacher wait time is not an important variable to consider.

Specifically, the case method of instruction places a heavy emphasis on student discussion with the teacher acting as a facilitator of discussion. One primary means of evaluation in case method courses is student participation in class. In fact, participation may count for 30 to 60% of the final grade. This would indicate that students are highly motivated to contribute in class. Consequently, when an instructor asks a question, one-third to one-half of the students may have their hands

in the air at any one time. In university discussion classes not using the case method, it has been found that wait time is often three seconds or less (Andrews, 1980). However, participation in these classes seldom plays as important a role in learning and evaluation as it does in case method classrooms. Therefore, teacher wait time in case method classes is even shorter than in the typical university classroom and therefore is not nearly as discriminating a variable in case method classes as it appears to be at the primary or secondary level.

As has been noted by many investigators, student classroom participation tends to decline from primary to postsecondary years (Sadker & Sadker, 1986). Smith (1977) found that college students participated in classroom interaction less than 20% of the time. Also, the number of college students who do not participate at all in classroom interactions rises to 50% (Sadker & Sadker, 1986). This result is perhaps not surprising due to the overreliance at the postsecondary level on the lecture method as the principle teaching method. However, unlike most postsecondary faculties, business faculties often utilize the case study method rather than the lecture method in their classrooms (Paget, 1988).

Teacher Questions

One variable that has been found to be important in classroom interaction is type of teacher question. A meta-analysis of experimental studies on teacher questioning found that when students are asked questions which stimulate their critical thinking skills, they are likely to have strong achievement gains (Redfield & Waldman-Rosseau, 1981). Typically, researchers have examined the cognitive level of

teacher questions using Bloom's taxonomy of educational objectives as a framework for determining the difference between higher and lower level cognitive questions (Andrews, 1980; Clark, Gage, Marx, Peterson, Staybrook, & Winne,1979; Winne, 1979). Bloom's taxonomy has six classes, labelled knowledge, comprehension, application, analysis, synthesis and evaluation (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). In general, low level questions are those that require only the bottom two levels of the classification scheme, namely knowledge or comprehension. Low level questions require students to recall information that they have read or been previously taught. The student may be required to summarize or extrapolate from the material presented but is not required to act on or manipulate the information in any way. High level questions relate to the other four classes and in general involve more abstract reasoning on the part of the student. Students may be required to manipulate pieces of information, form judgements, or apply general principles to specific cases.

Goodwin, Sharp, Cloutier, Diamond, and Dalgaard (1983) suggest that the level of question a teacher chooses to use will depend upon what the teacher wants to achieve in the discussion. For determining student's comprehension of the material, low level questions are often best whereas for the development of critical thinking skills and problem-solving skills, it is necessary to ask higher cognitive level questions. Typically teachers utilize both types of questions in any class.

One factor that affects how teacher questions influence student achievement is the match or congruence between teacher question and student response. Several studies such as Foster (1980) and Dantonio and

Paradise (1988) have found that students tend to respond at the same cognitive level as the teacher's questions. Contrary to this view, Dillon (1982) has criticized research on teacher questioning by saying that there is often a very large discrepancy between the type of teacher question and type of student response. One major difference between these two studies is the age of the subjects. Foster's subjects were third-year medical students, whereas Dillon's subjects were secondary school students. Much of the research on teacher questioning has focused on elementary and secondary school children (e.g. Winne, 1979), with little research being performed on post-secondary students.

Foster's (1980) study of third-year medical students is one of the few studies that has been done with this group. In this study, 62 small group discussions were observed and coded for cognitive level. It was found that there was a significant correlation between type of teacher questions and student response, particularly for higher level cognitive questions. However, a major drawback of this study was that discussion was not the principal method of learning used in the courses. It would seem important to examine teacher-student interactions in an environment where discussion was the principal learning method. Furthermore, the focus on primary and secondary school children in this literature may tell us little about the cognitive development of adults within the university system.

The Case Method

The case method of instruction has been employed by many business and law schools since the early 1900's (Kingsley, 1982). In the first year of the MBA program at the University of Western Ontario, students

participate in case method classes over 90% of the time and will have completed between 300 to 400 case analyses by the end of the first year (Wynant, Shaw, Fry & Erskine, 1986). Like the real world, the situations which are presented to students in cases are often incomplete (Argyris, 1980). Therefore, a case can be seen as a type of ill-defined problem. Unlike well-defined problems, ill-defined problems require the learner to fill in the blanks of the problem definition, and therefore to play a more active role in this beginning step of the problem-solving process (Hayes, 1978).

Cases seldom have any exact solution and students must learn to cope with a sense of uncertainty about the decision they have chosen (McNair, 1954; Paget, 1988). Therefore, the cases utilized in business education differ from those in law. In law, decisions are often based on past cases that established precedent. In management education, there are no such definitive cases to guide student action. Because the past is not always a reliable guide to the future, students must develop analytical skills that will aid them in any future decision making (Kingsley, 1982). In general, there are four major steps to case analysis. Students are required to first define the problem and then to develop alternatives or strategies for solving the problem. Next they must evaluate the alternatives, and finally they must select and implement the best strategy or alternative (Douglas, 1990).

Students in the case method must be active participants in learning (McNair, 1954). The case method is considered to be an interactive learning technique in which there is a high degree of student-teacher interaction (Nicastro, 1991). The skilled instructor in

case discussion acts as a facilitator, attempting to make the case as realistic and involving as possible (Smith, 1987). Teachers try to discourage student dependence in an attempt to foster student centred learning (Smith, 1987; Nicastro, 1991). Students must learn how to discern which are the important and unimportant facts in a case, to develop possible solutions to the problem, and to determine what is the appropriate course of action (Kingsley, 1982).

Although the case method has been widely used in management education at the undergraduate, graduate, and postgraduate levels for over 80 years, very little research has been performed to assess its pedagogical soundness. Moreover, what little research that has been done was mostly performed 20 to 30 years ago (Fox, 1963; Watson, 1975), and much of it was basically anecdotal or descriptive in design. For instance, a study by Fox (1963) compared case analyses performed by students at the beginning and at the end of a course on human relations. The results indicated that one-third of the students substantially improved, one-third showed modest improvement and one-third showed little or no improvement. Although these results are of some value, they say nothing about the effectiveness of the case method relative to other methods, or the critical features that make it effective.

Some research has in fact investigated the effectiveness of the case method relative to other methods in producing gains in student achievement (Butler, 1966; Watson, 1975). Butler compared the lecture-discussion method with the case method in a university course involving college seniors. There were no pre-group differences between the lecture and case groups in terms of scholastic ability or prior achievement. The

two groups were taught by the same instructor and had the same course textbook and readings. At the end of the course, it was found that students taught by the case method achieved significantly better on a multiple-choice examination than students taught by lecture-discussion.

Watson (1975) compared case study and lecture methods in an introductory management course at the undergraduate level. Again, there were no pre-experimental differences between students in the two conditions. Students were given two tests to measure achievement: one test measured acquisition of knowledge in six key areas, the other measured student ability to apply management concepts. No significant difference was found between the two groups in terms of knowledge acquisition except in the area of communications, where the case study method was superior to the lecture method. However, the case method group was significantly better than the lecture group at teaching students to apply management concepts and principles. Watson (1975) suggests that one reason for this difference is that case method students received more feedback from the instructor and from other students on their case analyses, and had more opportunity to develop application skills in class discussion. Watson also found that case method students perceived a more positive learning climate than did the lecture group. He informally observed that case method students were more likely to ask questions and to participate in class interactions than were lecture-discussion students.

Similar results were found by Carroll, Paine, and Ivancevich (1972) in a survey of industry trainers regarding the relative effectiveness of different teaching methods. The trainers ranked the

case study method as significantly more effective than the lecture method in terms of knowledge acquisition and retention. However, they rated programmed instruction as more effective than either the case method or lecturing for increasing learning in these areas. Carroll et al. also asked trainers which method was most effective in terms of teaching problem solving. The trainers clearly indicated that the case study method was more effective for this objective than any other teaching method, including lectures, role-playing, business games, and programmed instruction. This is an important finding because the principal purpose of the case method is to teach problem-solving skills. Smith (1987) cites other research suggesting that the case method is effective in teaching students critical thinking and problem-solving skills.

None of the research to date on the case method has explicitly looked at the role of class discussion and interaction in the development of problem-solving skills, nor the influence of student characteristics on class interaction. It is supposedly through class interaction that students learn the process of good decision making. As this method demands a great deal of involvement from the student with both the cases and with other students in the class, it seems pertinent to address what student attributes might be related to class participation in case method classes. None of the past research has explicitly examined the nature of questions asked by teachers in class. It seems evident that the degree to which students learn critical thinking skills via class discussion will be dependent in part on the types of questions they are asked in class. The present research focused

on students enroled in the first year of the Masters of Business Administration (MBA) program at the University of Western Ontario. These students utilize the case method in all of their first year courses, and represent a heterogeneous population from a wide variety of backgrounds (Wynant, Shaw, Fry, & Erskine, 1986). It was expected that differences in student characteristics would manifest themselves in observable ways in class discussion and that teacher questions would influence participation and learning in the classroom.

Student Characteristics

Research on student classroom participation in class has shown that some students appear to be more likely to participate than others (Tobin & Gallagher, 1987). High level participators (target students) initiate more comments in class and are called upon more often than are others. Tobin and Gallagher investigated what differentiates target students from others. One characteristic that clearly separated target students from nontarget students was gender. Although males were more likely to be target students than females, not all males were target students (Tobin & Gallagher, 1987). Thus, it appears important to determine what other individual characteristics may be important for a high degree of classroom interaction.

Several other student characteristics appear to be critical predictors of student participation in classroom discussion. In addition to gender, these characteristics include social-cognitive variables such as critical thinking skills (Tobin & Capie, 1982) self-esteem (Morrison and Thomas, 1974/75), assertiveness (Tobin & Gallagher, 1987), and public speaking anxiety (Comadena & Prusank, 1988). Each of these

student characteristics is discussed in turn below.

Student gender. For a number of reasons, gender is an important variable to consider when examining classroom interaction. Numerous studies have shown that from the preschool years through university, there are gender differences in classroom interaction. For example, males speak more frequently in the classroom than do females and are more likely to be the focus of teacher attention than are females (Sadker & Sadker, 1986; Sandler, 1986; Hall, 1982; French & French, 1984: Tobin & Garnett, 1987). Male students were found in one study to be 20 times more likely to volunteer responses than were females (Tobin & Gallagher, 1987).

The reasons for these gender differences in classroom interaction are not known, although there is some evidence that male and female teachers treat boys and girls differently. Good, Sikes and Brophy (1973) investigated classroom interaction in 16 junior high classrooms for one hour a day for 10 days at the beginning of the fall term. Although the pattern of interaction with male and female students was similar for male and female teachers, it was found that both male and female teachers treated male and female students unequally. In particular, high achieving males received more attention (greater frequencies of interaction and more positive teacher feedback) than other students. Also, there were differences in the type of question asked of boys and girls. Boys were more likely to be asked questions that involved higher level problem solving or critical thinking skills (higher cognitive level questions), while girls were more frequently asked fact or knowledge questions involving one word or short answer responses (low

level cognitive questions). Because a correlation has been found between achievement gains and the cognitive level of questions asked in class discussion (Redfield & Waldman Rosseau, 1981), these results have some strong implications. At the very least, the findings of Good et al. suggest that the actual classroom experience of boys and girls is not equal and that the achievement of girls may be hindered by their lack of participation in higher level interactions with the teacher.

Similarly, Tobin and Garnett's study (1987) of junior high and high school students in Australia showed that males were asked more higher level cognitive questions in classroom discussion than were females. Unlike Good et al. (1973), no difference was found between males and females in frequency of low level cognitive questions. This pattern of classroom interaction was found in classes taught by both male and female teachers. In addition, Tobin and Garnett found that male students were more likely to initiate questions than female students and were asked to respond three times more frequently than were female students. This pattern was found even in classes that had more female than male students.

Although many studies have confirmed that there are gender differences in classroom interaction, some studies have not supported this hypothesis. Dillon (1982) examined class participation of 25 high school discussion classes. He found no differences in percentage of student talk when the number of males was equal to females. When the number of boys in a class increased, so did the percentage of student talk and turns at talk by boys. These results are difficult to reconcile with Tobin and Garnett's (1987) results. Specifically, Tobin and Garnett

found that boys tend to dominate in classroom interaction even when there were more girls than boys present in the class.

One possible explanation for the varied results of these studies is the different methodology employed. In the Tobin and Garnett (1987) study, data were collected by having trained observers keep narrative records of the classroom activities during eight to ten lessons. Observers also coded student participation and the cognitive level of the interaction. In Dillon's (1982) research, a transcription was made of a randomly chosen 10-minute segment from 25 separate classes. It may be that a 10-minute segment of class discussion is not sufficient to delineate accurately gender differences in interaction. Although Dillon coded frequency and length of interactions, he did not code the quality of the interactions in any way. He also made no attempt to identify target students. The research performed by Good et al. (1973) and Tobin and Garnett (1987) suggests that determining the quality of student engagement in different types of classroom interactions (cognitive level) is an important category to consider when evaluating student participation in discussion; and furthermore, that the type of methodology employed in recording interactions is important.

Riley (1989) hypothesized that gender differences in class discussion will be magnified in case method classes. He has suggested that the argumentative, competitive nature of discussion in many case classes is unlikely to provide a classroom climate that will facilitate academic learning for most women. If women are less successful than men at raising their hands first in class (Tobin & Gallagher, 1987), and are called upon by instructors less frequently than their male colleagues

(Hall, 1982), then it seems unlikely that case classes will foster women's academic growth. Although Riley has not performed a formal study of case classrooms, his informal observations all supported these hypotheses.

Social-cognitive variables. Critical thinking skills appear to be another important variable to consider when discussing classroom participation in general and problem solving in particular in relation to the case method. Several studies have found a strong correlation between critical thinking skills and student academic achievement (Foster, 1980; Tobin & Capie, 1982; Tobin & Gallagher, 1987). The studies of Tobin and Capie (1982) and Tobin and Gallagher (1987) both found significant correlations between formal reasoning ability, student participation in the classroom, and science achievement in high school students. More importantly, the study by Foster of third year medical students found that student entry characteristics, particularly critical thinking as measured by the Watson Glaser Critical Thinking Appraisal, was significantly predictive of outcome measures such as preliminary medical board exam score.

Critical thinking also seems an important variable to consider when examining case method classes. These classes demand that students take a problem-solving approach to each case. Problem-solving requires the student to engage in critical thinking (Hart, 1990). Therefore, it seems likely that students who have higher critical thinking scores should be better at case analysis, which should result in higher participation rates and higher grades.

Furthermore, Tobin and Gallagher (1987) report that frequent

participators (target students) had better formal reasoning abilities than other students, and were often called upon by teachers when it was important that the class receive the correct response. For this reason, critical thinking skills may be an important variable to examine in case method classes. Although teachers in these classes are supposed to be non-directive, they also are trying to ensure that students are learning about the process of problem solving. It may be that once instructors have determined who in the class has better critical thinking skills, they will call upon these students at critical times in the class.

Another student attribute that appears to be correlated with participation in the classroom is self-esteem (Morrison & Thomas, 1974/75; Williams, 1971). Self-esteem has been defined as the set of evaluative attitudes that people have about themselves or their accomplishments (Morrison & Thomas, 1974/75). It has been postulated that students with low self-esteem are likely to withdraw themselves from social situations rather than risk the disapproval of others (Williams, 1971). This hypothesis suggests that individuals with low self-esteem are unlikely to participate in classroom discussion because of their fear of disapproval from the teacher and peers. Some researchers have also theorized that an individual's self-esteem may be situation specific (Morrison & Thomas, 1974/75). In other words, people may evince high self-esteem in their work environment yet have low self-esteem about their social interaction with peers.

Morrison and Thomas (1974/75) investigated the relationship between self-esteem and classroom participation by having college students enroled in an introductory psychology course complete two self-

report inventories assessing self-esteem, plus a questionnaire indicating their level of participation in class discussion. The format of the course was lecture-discussion. Self-esteem, as measured by a subscale of the Coopersmith Self-Esteem Inventory (1981) related to school self-esteem, was found to be significantly correlated with self-reports of participation in the classroom. Subjects with low self-esteem spoke less frequently than subjects with high self-esteem and were less likely to contribute their thoughts to the class discussion. Morrison and Thomas indicate that it is important in future research to determine the veracity of students' self-reports of participation.

Similarly, a study by Williams (1971) examined the relationship between personality characteristics and classroom participation. In this study, self-esteem was measured by the Tennessee Self-Concept Scale (Fitts, 1965), and participation was determined by teacher records of student classroom participation. Students were classified as active participants if they participated at least once a class, as intermediate participants if they spoke every third to fifth class, or as nonparticipants if they never commented unless called upon by the teacher. A significant difference was found between nonparticipants and active and intermediate participants in terms of their level of self-esteem. Again in this study, low self-esteem subjects were least likely to be participants in discussion. As in Morrison and Thomas (1974/75), no independent confirmation of student participation was performed. It is interesting to note that in both of these studies, no tests were performed to evaluate whether there was a difference between males and females in terms of their level of self-esteem. Sadker and Sadker (1986)

suggest that women tend to have lower self-esteem than men at the post-secondary level. In the present study, however, it is possible that no differences will be found between men and women in self-esteem, because women who choose a graduate management program are likely to have higher self-esteem than the norm for women.

Another attribute that mediates classroom interaction is assertiveness. One interesting result of a study executed by Tobin and Gallagher (1987) was that teachers were more likely to direct questions to students who raised their hands or called out in class than to ask more reticent students. Therefore, those students who volunteered their responses were apt to be labelled target students. This finding suggests that students who are assertive are liable to have higher participation scores than are others. In case study classes with 65 or more students, it may be particularly important to be assertive in order to be recognized by the instructor because as many as half the class may have their hands raised at any time. Students who are non-assertive and wait for the instructor to call upon them for a response may seldom get a chance to participate.

Anxiety, particularly public speaking anxiety or communication apprehension, is another important personality trait that may influence participation in classroom discussion. Research has shown a significant negative correlation between student anxiety level and participation (Seitchik, 1981/82). Furthermore, it has been found that anxiety associated with speaking in class is negatively correlated with academic achievement (Comadena & Prusank, 1988). Comadena and Prusank suggest that active participation in classroom discussion is an essential part

of the learning process and therefore students who avoid participation in the classroom will find their learning hampered. Also, anxiety has been found to be inversely related to self-esteem (McCroskey, 1984). Therefore, anxiety may be a personality factor relating directly to participation, or may manifest itself indirectly in terms of lack of assertiveness, or low self-esteem. Again, due to the size of case study classes and the speed with which discussion takes place, students who have public speaking or communication apprehension may have difficulty volunteering to speak in class.

Student Academic Background. Finally it appears important to include academic background characteristics such as undergraduate degree type, undergraduate average, and total Graduate Management Admissions Test (GMAT) scores as predictors of student participation and grades. Both undergraduate average and GMAT scores are commonly used by Business schools to determine admission to their MBA programs (Schwan, 1988) and these factors have been found to be important predictors of graduate scholastic success (Breaugh, & Mann, 1981; McClure, Wells, & Bowerman, 1986). Degree type was investigated in the present study because it seems plausible that students with degrees in disciplines such as Engineering that place heavy emphasis on problem-solving and quantitative skills might earn higher grades in business courses such as Finance that stress those same skills. Previous research has typically not included degree type as a variable. At the University of Western Ontario at least 25 percent of MBA students are Engineers. The role of degree type in determining graduate academic performance is unclear because researchers usually try to correlate overall graduate academic

averages with degree type rather than looking at individual course grades and undergraduate degree type (e.g. McClure, Wells, & Bowerman, 1986).

Subject Matter

Although social-cognitive and academic background characteristics play an important role in determining who is likely to participate in classroom discussion, another potentially important variable is subject matter. In the study by Good, Sikes and Brophy (1973), subject matter was examined along with teacher and student gender as predictors of classroom interaction. Data were collected from junior high school students in four mathematics classes and four social studies classes. It was found that subject matter had a strong effect on classroom interaction, with social science classes showing higher levels of interaction than mathematics classes. In fact, subject matter had a stronger effect on interaction than either teacher gender or student gender. There were also differences between disciplines in classroom environments, with mathematics teachers being more punitive when students misbehaved.

The two subject areas investigated in the Good et al. (1973) study appear to involve different types of knowledge. Mathematics classes tend to involve "hard" or technical (procedural) knowledge whereas the social studies classes involve "soft" knowledge or knowledge about human relationships rather than abstract symbolic reasoning. This distinction between hard and soft knowledge is also applicable to business courses (Masoner, 1988). Certain subjects such as Finance or Accounting are more likely to involve "hard" knowledge and therefore to

focus on symbolic reasoning, whereas Marketing or Management Behaviour involve more "soft" knowledge. This differences could mean that students in Finance classes might be more likely to engage in higher level classroom thinking than students in Marketing. The results of the study by Good, Sikes, & Brophy (1973) suggests that subject matter differences may be a potent predictor of classroom interaction even in case method classes.

Summary

To summarize, most of the research to date on classroom interaction has focused on how teacher personality and teacher behaviour impact on student participation in the classroom. The subjects in most of these studies have been elementary and secondary school students. There is some evidence that at least at the primary and secondary school levels, student characteristics such as gender, critical thinking skills, self-esteem, assertiveness, and communication anxiety are related to classroom interaction. Several critical research questions remain to be answered. Researchers need to examine whether and how student attributes are related to actual classroom interaction and to outcome measures such as participation grades and achievement on tests measuring problem-solving skills. Also, it is imperative to determine if what has been discovered about classroom interaction at primary and secondary school levels is indeed true of classroom interactions at the postsecondary level. The results of the research by Tobin and his colleagues (1982, 1987) suggests that boys and girls are treated quite differently in the classroom. It is important to determine if this difference is present at the postsecondary level, particularly in light

of Tobin and Garnett's (1987) findings that boys were asked more high level cognitive questions than were girls.

Present Research

Rationale for the Present Research

For several reasons, the study of the case method in graduate management education seems ideally suited to investigating classroom interaction. The case method has at its centre class discussion. It is here that students hone their analytical and problem-solving skills. Participation in case classes accounts for a heavy percentage of the final course grade, so that students are likely to try to participate at much higher rates than would be found in university classrooms using lecture or lecture-discussion methods of instruction. Because the case method and variants of this method are widely utilized in business, law, medicine and other disciplines, research on it would have wide ranging implications. Also, if one wants to determine how student characteristics are related to classroom participation, then a graduate program seems ideal to study because graduate students are more likely than younger students to have relatively stable personality traits. In addition, the heterogeneous backgrounds of students in this professional program ensures some diversity in personality traits. There are also differences in the types of subjects that students must master in their first year of the program, thus allowing subject matter differences to be examined in the present study.

Hypotheses

The present research addressed these issues by examining classroom

participation among first year graduate students enroled in a Masters of Business Administration (MBA) program. The two major goals of this research were first, to investigate how student characteristics are related to classroom participation; and second, to examine the development of case method problem-solving skills throughout the academic year. By examining both the problem-solving components of student's utterances and the cognitive level of each of their responses, this research should provide new insights into the development of critical thinking skills.

The first hypotheses of the present research concerned the relationship between student characteristics and the major outcome measures, which were the final grades in the two courses. Student characteristics included social-cognitive variables such as critical thinking skills, self-esteem, assertiveness, and public speaking anxiety, as well as academic background variables such as undergraduate major, total GMAT scores and undergraduate average. The major outcome measures used in this research were first, the classroom participation grades assigned by Finance and Marketing instructors; and second, the final course grades based primarily on case analysis examinations. The examinations required students to perform case analyses and apply concepts and principles learned in class.

Other hypotheses examined process variables related to students' in-class behaviour. These variables included both qualitative and quantitative measures. Quantitative measures included the frequency of speaking and length of speaking in class. Qualitative measures included first, the components of problem solving in student responses, (e.g.,

problem statement, strategies, evaluation); and second, the cognitive level of the responses (high versus low level responses). For these hypotheses, the outcome measures were usually the final participation and course grades.

The specific hypotheses for the present research were as follows:

1. First, it was hypothesized that participants' academic background would be highly predictive of final course and participation grades in the two courses. The academic background variables that were examined included degree type, undergraduate average, and GMAT scores. It was theorized that participants degree type would influence their class participation, and therefore, affect what they learned in the two courses. For instance, because of their strong quantitative and analytical problem-solving skills, Engineering students should feel more comfortable speaking out in Finance classes and would be expected to have higher grades in Finance. Students from the Social Sciences and Business, on the other hand, might be expected to have higher grades in Marketing. It was believed that higher undergraduate averages and higher GMAT scores would be positively related to course grades.

2. Secondly, to fully elucidate how student characteristics might influence grades, both social-cognitive and academic background variables were examined collectively. It was hypothesized that although academic background variables would be related to grades, social-cognitive measures would be more important for determining grades in the two courses. It was theorized that, because of the

rigorous admission standards to the MBA program, students would uniformly have high undergraduate averages and high GMAT scores. More variability was expected on the social-cognitive measures as students were not directly screened on these variables as part of the admission procedure. Therefore, it was hypothesized that social-cognitive factors would have an impact on course grades when the effects of the academic background variables were statistically controlled.

In particular, it was posited that those participants who were highly assertive, had low communication anxiety, high self-esteem, and high critical thinking skills would have higher grades in the two courses. In general, it was postulated that social-cognitive characteristics would influence participation in the classroom, which, in turn would effect the acquisition of problem-solving skills which would be reflected in higher grades in the two courses.

3. It was postulated that participants who spoke longer or with greater frequency would receive higher participation grades, and perhaps higher final course grades as well. It had been theorized that higher participation rates would allow students to develop better problem-solving skills which would have a positive impact on their grades.

4. Furthermore, it was theorized that the amount of classroom participation could be predicted from social-cognitive measures.

Specifically, it was believed that participants with low communication anxiety, high assertiveness, high self-esteem and strong critical thinking skills would be more likely to speak more frequently, and at greater length. It was theorized that individuals with these characteristics would be less likely to be intimidated in the highly competitive atmosphere of the case classroom, and therefore, likely to speak.

5. Next, it was hypothesized that students who exhibited more complex problem-solving skills in class discussion would receive higher participation grades and higher final course grades. Again, quality of class discussion was thought to be critically linked to development of problem-solving skills in students, and problem-solving is the key behaviour that students are supposed to be demonstrating both in the classroom and on exams.

6. Similarly, it was postulated that participants who responded with higher level cognitive responses in class would achieve higher course grades. Higher cognitive level thinking is required for the latter stages of problem-solving (e.g. the evaluation of plans) and therefore, it seems logical to assume that students who demonstrate this level of cognitive thinking in class will be more likely to demonstrate these skills on exams and therefore receive higher course grades.

7. It was also expected that students who were asked higher level

cognitive questions by the teacher would have higher final grades. It is assumed that students who are frequently asked higher level cognitive questions are likely to develop better critical thinking skills. Therefore, it was postulated that students' exam grades would also be related to the type of question they are asked in class. Low level cognitive questions typically require students to perform rote recall of facts, and therefore, are unlikely to help students acquire higher level thinking skills.

8. It was postulated that gender would be related to classroom participation. Specifically, it was hypothesized that men would be asked more high level cognitive questions than women, and that this trend would be stronger in Finance than in Marketing. Finance, with its strong quantitative base, is viewed as a more traditionally male area of Business than Marketing, and therefore it seemed likely that women would be asked even fewer questions in this area than in Marketing. Based on the past research in this area, it was also theorized that women would speak less frequently and at shorter length than did men (Williams, 1990).

9. It was hypothesized that significant improvement in problem-solving skills would be demonstrated over the academic year, particularly in terms of the first stages of problem-solving such as identifying the problems or issues in a case. It was expected that less improvement would be apparent for the later stages of problem-solving related to the development of strategies or action

plans. This hypothesis was based on Wynant, Shaw, Fry, and Erskine's (1986) review of the University of Western Ontario's MBA program. The review concluded that in first-year MBA courses, the primary focus in teaching problem-solving skills was on teaching identification of problems, analysis of options and decision making. It was suggested that less attention was paid to the development of action plans and implementation of strategies. For novice problem-solvers, it has been found that the key task they face, especially for ill-defined problems, is trying to define and represent the problem (Hart, 1990).

In addition, it was theorized that higher level problem-solving skills such as strategies and evaluation would be more likely to occur in hard knowledge Finance classes than in soft knowledge Marketing classes. This hypothesis was investigated by analysing students' in-class utterances. This type of analysis is an important focus of the present research because most of the research to date on the case method has been anecdotal in nature with no detailed analysis of students' in-class utterances.

10. It was postulated that as students developed better problem-solving skills they would also demonstrate higher cognitive skills as the year progressed. High level responses require more synthesis of information, the same type of thinking that accompanies more complex problem-solving stages such as the development of strategies or the evaluation of plans. Furthermore, it was postulated that more higher level cognitive responses would

occur in Finance than in Marketing. Again, it is theorized that the more hard knowledge Finance classes require the development of higher cognitive level skills than do the soft knowledge Marketing classes. Therefore, it was expected that both time in year and the subject matter would effect the cognitive level of responses exhibited by students.

11. Finally, the present research investigated the relationship between teacher's questions and students' responses. Dantonio and Paradise (1988) found that there was congruence between the cognitive level of the question asked and student response, particularly for low level cognitively cued questions and for high conceptual level questions. Therefore, the cognitive level of instructor questions is an important variable to consider when examining the types of responses made by students. In the present study it was hypothesized that there would be a positive relationship found between the cognitive level of the teacher's questions and the student's responses.

METHOD

Participants

The participants in this study were 58 students in Year 1 of the two-year Masters of Business Administration program at the University of Western Ontario. Of the 63 students present in class during orientation week prior to the beginning of classes, 58 (92%) volunteered to participate in the study by signing consent forms. Of these 58 students, 49 completed all research instruments.

The sample consisted of 43 men and 15 women ranging in age from 22 to 34 (M=26). The participants had an average of 3.3 years of work experience. All but one had at least a Bachelor's degree: 14 had Engineering degrees, 14 Social Science degrees, 14 Commerce degrees and 15 other degrees. Their undergraduate averages ranged from 69% to 90%, with a mean of 78.4% (SD=4.8). The students had overall GMAT scores ranging from 420 to 710 with a mean score of 610 (SD=55.4).

The two male teachers who participated in the study were experienced case method teachers who had completed a Ph.D. in Business Administration and had achieved tenure in the Faculty. They were chosen on the recommendation of the MBA Chair who stated they were two of the best teachers in the school. Both teachers signed consent forms prior to beginning the study.

Instruments

Critical Thinking. This attribute was assessed using the Watson-Glaser Critical Thinking Appraisal (WGCTA, 1980). The WGCTA measures critical thinking as a general and broad construct (Pascarella, 1989). This instrument (see Appendix A) was revised in 1980 and is commonly

used to predict performance of high school, undergraduate and graduate students in situations involving critical thinking (Brabeck, 1983; Pascarella, 1989; Smith, 1977; Thompson & Smith, 1982). The WGCTA is composed of 80 items designed to measure five aspects of critical thinking: inference, recognition of assumptions, deduction, interpretation and evaluation of arguments. Scores on the instrument can range from 0 to 80, with higher scores indicating stronger critical thinking skills. It has been found to be internally consistent (split-half reliability coefficients ranging from .69 to .85 for different subscales) and to have reasonably good retest reliability over a three month interval (.73). It has also been found to have good alternate-form reliability (r=.75; Mitchell, 1985). Although construct validity has not been firmly established for this measure, Mitchell notes that it is the best measure of critical thinking currently available.

Assertiveness. Student assertiveness was measured using the Assertion Inventory (Gambrill & Richey, 1975), a 40-item Likert type self-report inventory (see Appendix B). This inventory measures degree of discomfort about performing behaviours in specific situations, and the likelihood of performing the behaviours anyway. Therefore, it measures an important distinction between discomfort and actual avoidance of performance of behaviours in specific situations. Scores on the degree of discomfort scale can range from 40 to 200, with higher discomfort scores indicating great degree discomfort about performing a specific behaviour in a particular situation. Similarly, scores on the response probability scale can range 40 to 200. The higher the response probability score, the less likely the individual is to display a

specific behaviour when presented with the situation. It is the response probability score that will be used in the present study, as the primary focus of the present research was on the likelihood of an individual being assertive not the person's attitude towards assertive behaviour.

The inventory was normed on three samples of social science undergraduates. It has been found to have good retest reliability over a six week period: .87 for the discomfort scale and .81 for the response probability scale. Also, the subjects had a wide range of scores on the two scales indicating the inventory was not encouraging stereotypic responses from the subjects.

Gambrill and Richey (1975) suggest that individuals can be classified into four categories depending on how they respond to the two scales. People who are low in discomfort and high in response probability would be truly assertive individuals. Those individuals who have high scores for both scales (discomfort and response probability) would be able to perform assertive acts but only with a great deal of anxiety. Gambrill and Richey suggest that those who have low scores on both scales seem to be adopting the attitude that assertion is useless, a "who cares" attitude. Finally, individuals who have a high level of discomfort and a low response probability can be classified as unassertive. The inventory has been validated on both clinical and undergraduate samples and was found to discriminate between the two (Gambrill & Richey, 1975).

Self-Esteem. This personality characteristic was measured using the Coopersmith Self-Esteem Inventory (SEI, 1967, see Appendix C). The SEI is a commonly utilized self-report measure of self-esteem (Mitchell,

1985), and has been found to predict participation grades in college students (Morrison & Thomas, 1974/75). The SEI adult form is a 25-item scale. Scores on the scale range from 0 to 100, with higher scores indicating greater self-esteem (scores on the scale are multiplied by four to get the full scale score out of 100). Mitchell suggests that the inventory has adequate reliability and validity for use in research. The alpha reliability of the full scale was found to be .75 in a study of undergraduate college students (Ahmed, Valliant, & Swindle, 1985).

Anxiety. Trait communication anxiety was assessed using the Personal Report of Communication Apprehension (PRCA-24), developed by McCroskey (1982). This 24-item Likert type instrument (see Appendix D) has been found to have good internal consistency (Alpha=.94; McCroskey & Beatty, 1984) and has evidence of predictive and construct validity (Levine & McCroskey, 1990; McCroskey,1984). It measures communication apprehension in four separate contexts: public speaking, talking in dyads, talking in small groups and talking in classes or meetings. Scores on each of the scales range from 6 to 30, with higher scores indicating a greater degree of apprehension. Scores for the total communication apprehension scale may range from 24 to 120. It has also been found to correlate moderately with state anxiety as measured by Spielberger's State-Trait Anxiety Inventory (STAI,1970).

Problem-solving Component Scale.To score the problem-solving components of class discussion, a scoring manual similar to that used by Henshaw (1979) was created. The reason for developing a scoring manual was that none of the existing observation methods was ideally suited to the present study. Many of the existing observation systems are designed

mainly for quantifying of specific teacher behaviours, with little emphasis on analysis of student responses (Needels, 1988). These systems are thus inappropriate for business classes, because the focus in the case study classes is theoretically on the students, with the instructor acting as a non-directive facilitator of discussion. Also, most of the emphasis in the existing systems is on measuring the frequencies of specific behaviours rather than analysing the quality of classroom interaction.

To develop a coding manual for problem solving, three first year MBA classes were videotaped at the end of the 1989-90 spring term (one in management behaviour, one in marketing and one in operations management). None of these data were used for hypothesis testing in the present study. The classes were videotaped with two cameras so that all students could be observed. The location of the students and their gender was marked on a class plan (see Appendix E). A copy of the case being discussed in class was also received from the teacher.

The next step involved transcribing the dialogue and developing a categorical coding scheme to assess problem-solving skill components of responses made by students. This involved dividing protocol sentences into scorable units of analysis (see Appendix F) and developing a manual for scoring these units into problem-solving components (see Appendix G). The rules for dividing protocol sentences into scorable units were developed by Cummings (1987). Each response was often broken down into several units of speech, and then each of the units was scored for its problem-solving element. The co. onents of problem-solving came from the research literature which focus on the steps learners usually take to

solve a problem (Glover & Bruning, 1987; Sternberg, 1981; Dewey, 1933); and from critical examination of the dialogue of the classes observed in 1989-1990. The problem-solving categories utilized include (a) answering direct questions (ANS); (b) stating the problem (PS); (c) specifying the major problem or issues (PI); (d) performing numerical analysis (NUM); (e) stating strategies (ST); (f) elaborating on a strategy or situation (EL); (g) stating a reason (RN) and (h) evaluation of strategies or plans (EV). These components are defined briefly below and discussed in more detail in Appendix E.

Answering direct questions refers to the student answering direct factual questions. These questions are usually closed-ended questions and require a one or two word response such as "yes" or "no". Problem statement refers to paraphrasing the case. An example would be "Right now the system that he is operating will take 300 customers at any one time." The information in this student statement is taken directly from the case. Problem Issue is defined as specifying the major issues or problems in a case without suggesting any plans for action or strategies. For example, "We've got to figure out how to screen out who gets [the product] and who doesn't." Numerical analysis involves the students performing calculations to help them analyze the problem, such as "500 calls per month by six students which is 3000 calls." Strategies are plans of action or methods for dealing with a particular problem, for example "When you have your first introduction sales you could say if you buy Gatorade we'll give you an extra case", or "for the product I want to start with three sizes." Elaboration usually involves giving extra details about a strategy or plan, for example " So I thought their

main strategy should be to get down the $400,000.00 [debt] by putting some sort of deadline on Coast (strategy), saying within 6 months you should pay us $75,000.00 a month" (elaboration on a strategy). The next problem-solving component is Reason which is often an explanation for a strategy or plan, such as "Just try and hang in with Coast while you are putting together some other alternative (strategy) because you can't just shut them down and expect to get some other method of distribution off and rolling immediately" (reason for strategy). The final problem-solving category is Evaluation. In this category, students judge the feasibility of a plan or strategy: "If you cut them off [their supplies] they are going to go under."

Once the problem-solving coding scheme had been developed, training was begun with the two raters One of the raters was a graduate student in psychology and the other was a fourth-year honours student. Training transcripts were first unitized according to the rules contained in the scoring manual. The reliability or percentage of agreement on the unitization was 93% after 20 hours of training. Differences in how the utterances should be unitized were resolved by consensus.

Next, training in scoring the problem-solving components occurred. The two raters first read the case involved in a particular class discussion and then scored part of a training transcript. Training involved discussion and clarification of issues in scoring until consensus occurred. Reliability was assessed using Cohen's (1960) coefficient of interjudge agreement. This statistic indicates the proportion of agreement between two raters after chance agreement has been removed. This method was chosen because the scale was categorical

rather than an interval in measurement. Also, with this method observers must have agreement on just about every unit in order to realize high reliability (Foster, 1980). After 30 hours of training, inter-rater reliability reached .80 and training was discontinued. At this point, ratings of actual data from the participants of the present study began. To ensure reliability after the first transcript was scored, inter-rater reliability was checked and the reliability coefficient was .77. The first half of a second transcript was then scored by both raters and the interjudge reliability coefficient was .87. The rest of the transcripts were scored by only one rater.

Cognitive Level of Teacher Questions and Student Responses. A second coding scheme was developed to assess the cognitive level of whole student response or teacher question. The coding manual (see Appendix H) describes the procedures used for classifying utterances and gives detailed information and examples of low and high level responses. Winne (1979) suggested that low level cognitive questions and responses tend to be fact oriented. Low level questions tend to require responses that are straight from the text or reading material. In terms of Bloom's (1956) taxonomy, low level utterances are related to the two lowest levels of knowledge and comprehension. Both problem statement and problem issue are examples of low level cognitive thinking. For example a student might say "There are two different ones depending upon whether they process the transactions internally specifically in the Chemical Bank or externally". This information comes directly from the written case. A low level question from the teacher would be "Has he got any options on pricing?" Again the teacher is asking for factual information

from the case and is simply asking a recall question of the student.

In contrast, high cognitive level questions require students to synthesize information and to apply greater abstract reasoning skills. An example of high level question would be "Now what if I decide to issue you $400,000 more stock, what impact does that have on Coast Distributors?" High level utterances are therefore related to the four Bloom levels of application, analysis, synthesis and evaluation. It includes utterances that involve the problem-solving components of strategies and evaluation. For example a high level cognitive response from a student would be, "I want to see his payables come down because he is using his payables to finance growth [and] he is incorrect in doing that. He should be financing through long term debt". In this example the student evaluates the situation.

After the coding manual for cognitive level utterances was completed, training began using the three training transcripts. All teacher and student utterances were coded as either high or low level and reliability was checked using Cohen's (1960) coefficient of interjudge agreement. The raters were a graduate student in psychology and a professor of educational psychology. Training continued for 15 hours until the interjudge agreement reached .85. At this point coding of the actual data began. After one transcript was coded, interjudge reliability was assessed and the reliability coefficient was .85. One rater coded the rest of the transcripts on her own.

Procedure

Prior to the beginning of classes the teachers of the two business courses were asked to participate in the study and were given an

information letter describing the study (see Appendix I). The teachers also signed a consent form. During the orientation week before the beginning of classes, the investigator described the general purpose of the study to the first year MBA class and solicited volunteers. Student participants were given a letter describing the research and what would be expected of them (see Appendix J). Students who did not wish to participate in the study were given the option of having their faces erased from the video. In addition, they were given a packet containing a consent form, a demographic information sheet (see Appendix K), an information sheet about the instruments and the four research instruments. Subjects were asked to return the packet the following week on the first day of classes. All of the research instruments were completed by the participants at home and took about one hour to fill out. The instruments were randomized within each packet and subjects were asked to complete the instruments in a prescribed order. Once the investigator received the packet, all forms were coded by number to assure anonymity.

The consent form gave the investigator permission to obtain students' final grades in Marketing and Finance classes, GMAT scores, and undergraduate averages from the Business School Admissions Office. Students received two marks for each course at the end of the year. One mark was a participation grade and the other a composite course grade based primarily on their completion of case examinations. In Finance, the final composite course grade was based 70% on case examinations and reports and 30% on class participation. In Marketing, the final composite course grade was based 65% on case examinations and reports

and 35% on participation. The exams and reports involve an in-depth case analysis where students must apply management concepts and principles.

For each course grade, students could receive a mark ranging from -1 to +4 point scale (with 10 scale points separating these end points), with a 1 indicating unsatisfactory performance and a 4+ indicating outstanding performance. A score of 2 or 2+ was considered to be acceptable or average work. These grades were recoded on a 12-point scale, so that a 1- became a 1, a 1 became a 2, a 1+ became a 3 and so on.

Classes were videotaped at three intervals throughout the school year, during the first week of classes, right before the Christmas break and at the end of the school year in March. Each 80-minute class was videotaped in colour with two cameras positioned at the front of the class. Three microphones were hung throughout the class so that all dialogue could be recorded. Although this method was by no means unobtrusive, MBA classes typically have several classes videotaped throughout the year for evaluation and students appeared quite comfortable once the first few minutes of taping had elapsed. Students were unaware which classes would be taped prior to the appearance of the investigator in the class. The investigator and an assistant also completed a class plan which indicated where each student sat and the order that students spoke within each class. Each student had a name plate in front of them which assisted the investigator in identifying each respondent.

Each videotape was then transcribed by the investigator and her assistants. This resulted in about 40 pages of transcribed dialogue per

tape. A running clock on the bottom of the tape was used to determine the length of time each participant spoke.

Next, each of the transcripts was scored with each utterance divided into scorable units and then each unit of speech was categorized according to the problem-solving scheme. Then each of the responses/questions of students and teachers were categorized as either high or low in cognitive level. Therefore, for each of the tapes (3 time periods X 2 courses = 6 tapes in total), each student received a total score for each of the problem-solving components, two cognitive level type scores (number of high responses and number of low responses), and four scores indicating whether students matched or did not match the cognitive level of the teacher's question (i.e., high teacher question /high student response, low teacher question /low student response, high teacher question /low student response, low teacher question /high student response). Table 1 is a summary table of all the variables measured in the present study.

Table 1

A Summary Table of Variables Used in the Present Study.

Variable type and name	Definition
Student characteristic variables	
(a) Gender	Sex of subject
(b) Academic Background	
GMAT scores	Total scores on Graduate Management Admission Test
Degree Type	Four degree types- Engineering, Commerce, Social Sciences or other
Undergraduate Average	Undergraduate average out of 100%
(c) Social-cognitive characteristics	
Critical Thinking	Measured by the Watson-Glaser Critical Thinking Appraisal (1964) -measures subject's ability to define problems plus skills and knowledge of hypothesis testing
Assertiveness	Measured by the Assertion Inventory (1975)- assesses subject's likelihood of performing behaviours
Self-esteem	Measured by Coopersmith Self-esteem Inventory (1967)- overall feelings of merit an individual hold's for oneself
Anxiety	Measured by the Personal Report of Communication Anxiety (1982)- assesses the apprehension of subjects to talking in a variety of situations
Classroom participation variables	
(a) Quantitative measures	
Speaking Length	The length of subject's responses was timed in seconds for each of the 6 taped classes.

Table 1 (continued)

Variable type and name	Definition
Speaking Frequency	The number of times each subject spoke was recorded for each of the 6 taped classes.
(b) Qualitative measures	
Problem-solving	Problem-solving components of each of the student's utterances was assessed using a manual developed by the investigator. Subjects received a score for the frequency of each of 8 components for each class.
Cognitive Level	Cognitive level of each utterance of both teachers and students was assessed using a manual developed by the investigator. The manual was based on Bloom's (1956) taxonomy. Each utterance was classified as low (factual information) or high (analytic) cognitive level. For each taped class, the frequency of high and low level responses was recorded for each student. Each teacher's question was also coded for cognitive level.
Match in Cognitive Level	The number of times student's responses matched or did not match the cognitive level of the teacher question was recorded for each type of responses (high or low).
Outcome variables	
Final Grades	Subjects received two final grades in each course. One is a participation grade based on the quality of their responses in class. The second is a final course grade based primarily on case examinations.

RESULTS

Several types of analyses were performed on the data collected in the present study. First, preliminary descriptive statistics were performed on the research instruments, using SPSS and SPSSPC computer programs (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). Second, hypothesized relationships between student characteristic measures and development of problem-solving skills were investigated by multiple regression and multivariate analyses of variance (MANOVA), using SPSS and BMDP4V (Dixon, 1990) computer programs. Finally, teacher-student interaction patterns were explored using analysis of variance (ANOVA). The results of these analyses will be discussed in turn below.

Preliminary Descriptive Statistics

Preliminary descriptive statistics were performed on all measures of social-cognitive characteristics. As Tabachnick and Fidell (1989) suggest, it is important to test variables used in multivariate analyses for significant departures from normality. Consequently each of the social-cognitive variables was tested for skewness. It will only be reported here if the scores on the variable were found to be significantly skewed as determined by SPSS. Normative data and descriptive statistics for the total sample and by gender are given in Table 2.

Assertion Inventory. As can be seen in Table 2, mean discomfort scores were lower than mean response probability scores on the Assertion Inventory. This result is similar to the data reported by Gambrill and Richey (1975). However, the MBA students in the present study tended to show less discomfort and a greater response probability than the

Table 2

Descriptive Statistics for Male and Female Subjects on the Social-Cognitive Characteristics

Measure	Total Group (N=50) Mean (SD)	Men (N=39) Mean (SD)	Women (N=11) Mean (SD)
Assertion Inventory			
Discomfort Score	85.22 (18.78)	85.23 (19.70)	85.18 (15.92)
Response Probability Score	96.02 (18.02)	97.39 (18.22)	91.18 (17.27)
Coopersmith SEI	84.24 (13.14)	85.95 (12.65)	78.18 (13.67)
Personal Communication of Apprehension			
Total Score	56.26 (14.16)	56.59 (14.89)	55.09 (11.55)
Group Discussion	12.70 (4.20)	13.08 (4.52)	11.73 (2.80)
Meetings	13.88 (4.77)	13.46 (4.63)	15.36 (5.16)
Interpersonal Conversation	11.94 (3.30)	12.21 (3.35)	11.00 (3.07)
Public Speaking	17.60 (5.16)	17.54 (5.39)	17.82 (4.47)
Watson-Glaser Critical Thinking Appraisal*			
Total Scores	69.10 (5.12)	68.97 (2.04)	69.60 (3.31)
Inference	11.82 (2.18)	11.68 (2.26)	12.40 (1.78)
Recognition	14.78 (1.33)	14.72 (1.45)	15.00 (.68)
Deduction	13.67 (1.82)	13.80 (1.87)	13.20 (1.62)
Interpretation	14.88 (.93)	14.90 (.97)	14.80 (.79)
Evaluation	13.96 (1.93)	13.90 (2.04)	14.20 (1.48)

* N= 49 (10 women and 39 men)

undergraduate students in Gambrill and Richey's research. No significant difference was found between male and female subjects' response probability scores, $t=(48)=1.01$, $p.>.05$.

Coopersmith Self-Esteem Inventory. As can be seen in Table 2, participants of this study generally had very high self-esteem, as indicated by an overall mean score of 84.24. This mean score is quite a bit higher than the mean of 71.7 (SD=18.8) for students aged 20-34 reported by Coopersmith (1981). It may be noted that self-esteem scores were negatively skewed (skewness=-1.167, $Z=-3.45$) indicating a significant departure from normality. Scores were clustered around the higher end of the distribution.

Some researchers have suggested that males and females differ in self-esteem (e.g., Sadker & Sadker, 1986). However, the difference in SEI scores between men (M=85.95) and women (M=78.18) graduate MBA students in the present study was not found to be significant, t (48)= 1.77, $p=.08$.

Personal Report of Communication Anxiety (PRCA). McCroskey(1982) suggests that scores below 59 on the PRCA are abnormal and states that individuals with such low scores are unlikely to experience communication apprehension even under conditions where such anxiety would be normal. As can be seen in Table 2, the average score for participants in this study was in the extreme low range for communication anxiety. Of the four subscales only group discussion was significantly positively skewed (skewness= 1.832. $Z=5.44$). Again, comparison of mean total scores for males versus females on the PRCA yielded a nonsignificant difference, $t(48)=.31$, $p=.76$.

Watson-Glaser Critical Thinking Appraisal (WGCTA). As shown in Table 2, the overall WGCTA mean in the present study (69.00) is very similar to the mean of 65.9 (SD=6.6) reported by Watson and Glaser (1980) for a sample of 58 MBA students. The overall WGCTA score was found to be significantly negatively skewed (skewness= -.996, Z=-2.93), indicating that most of the scores were clustered towards the higher end of the distribution. Both the recognition and evaluation subscales of the WGCTA were found to be negatively skewed (skewness= -1.631 and 1.05, Z=-4.79 and Z=-3.1 respectively). This skewness indicates that for each of these two subscales the scores tended to cluster around the higher end of the distribution. Again, no difference was found between the total scores for males (M=68.97) and females (M=69.6), $t(47)=-.34$, $p=.73$.

In summary, the descriptive statistics reported above suggest that the sample used in the present study was high in self-esteem and assertiveness and had lower communication anxiety than is usually found in the population at large. The WGCTA scores were similar to what had been found in other studies of MBA students. Because no significant sex differences were found for any of the four individual difference measures, the means for the total group were substituted in all further analyses for subjects who were missing data on these measures. This alternative of inserting group means for missing values is recommended by Tabachnick and Fidell (1989).

Relationship of Student Characteristics to Course Grades

Multiple regression analyses were performed to assess how well achievement in the two courses could be predicted by student characteristics, including student academic background variables and

social-cognitive measures. The first series of analyses addressed the predictive power of academic background variables alone. Degree type was analyzed separately in order to determine the unique contribution of this variable. Then the other two prime academic background variables, undergraduate average and total GMAT scores, were added to the analyses. The second series of multiple regression analyses assessed the power of social-cognitive measures to predict grades in the two courses. A final series of analyses was performed to assess the effects of the social-cognitive measures with academic background variables statistically controlled.

Student academic background variables. Hypothesis 1 postulated that grades in the two MBA courses could be predicted by academic background variables (degree type, GMAT scores, and undergraduate academic average). To test this hypothesis a series of hierarchical multiple regression analyses were performed.

In these analyses, the outcome variables were final participation and course grades in both courses and the predictor variables were degree type, total GMAT scores and undergraduate average. Degree type was dummy coded such that a student was entered as a set of three binary predictor variables (Cohen & Cohen, 1985). For example an Engineering degree was coded as 100, a Commerce degree as 010, Social Science as 001 and Other as 000. Students' degree type was entered on the first step of the regression. On the second step, participants' total GMAT scores and undergraduate averages were entered into the analysis.

Table 3 presents Multiple R and Beta values for the regression analyses. The academic background variables taken together were capable

Table 3

Multiple Regressions of Final Grades on Academic Background Variables

		Outcome variables							
		Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
	Predictors	Beta	t	Beta	t	Beta	t	Beta	t
First Step	Engineering	.47	2.92*	.58	3.92*	-.01	-.07	-.01	-.07
	Social Science	.24	1.48	.03	.19	.06	.34	.32	1.96
	Commerce	.29	1.81	.20	1.33	.25	1.51	.26	1.59
		R=.38		R=.53		R=.25		R=.34	
		F=2.89*		F=6.68*		F=1.12		F=2.26	
Second Step	Engineering	.42	2.61*	.46	3.27*	-.01	-.07	-.06	-.34
	Social Science	.21	1.36	-.00	-.01	.05	.27	.29	1.84
	Commerce	.28	1.80	.16	1.15	.26	1.55	.25	1.52
	GMAT	-.12	-.95	.14	1.16	-.19	-1.32	-.04	-.30
	Undergraduate Average	.30	2.28*	.31	2.69*	.18	1.24	.21	1.55
		R=.48		R=.64		R=.33		R=.40	
		F=2.92*		F=6.87*		F=1.20		F=1.85	

*p <.05

of predicting final Finance grades but not final Marketing grades. For the final Finance participation grade, there was a significant overall regression effect due to all academic background variables in combination, R=.48(5,50), F=2.92, p.<.02. This indicates that 23% of the outcome variance can be accounted for by the academic background variables. It can be seen that having an Engineering degree and a high undergraduate average account for a significant percentage in participation grades.

For the final Finance course grade, the multiple R was equal to .64 with the demographic variables collectively accounting for 40% of the outcome variance. Again the beta values indicate that the significant predictors were Engineering degree and undergraduate grades.

Social-cognitive measures and student academic background variables. According to Hypothesis 2, grades in the two courses were expected to be significantly related to the social-cognitive measures of assertiveness, self-esteem, communication anxiety, and critical thinking. Furthermore, it was expected that social-cognitive measures would significantly impact on final course grades even with the effects of the academic background variables statistically controlled. To examine this hypothesis, multiple regression analyses were executed first with the social-cognitive measures as predictor variables, and then with academic background variables and social-cognitive measures entered simultaneously. In both cases, the outcome measures were final grades in the two courses.

First, four standard multiple regression analyses were performed with social-cognitive measures as predictor variables and the four final

grade measures in Finance and Marketing as dependent variables. As Table 4 shows, social-cognitive measures collectively did not contribute significantly to the four outcome scores. Multiple R's ranged from .24 to .38 for the four social-cognitive predictors in combination with none of these reaching statistical significance.

In the previous series of analyses, intercorrelations of academic background variables with social-cognitive variables were not statistically controlled. Therefore, a series of multiple regressions were performed where academic background and social-cognitive measures were entered simultaneously. The predictor variables in these analyses were degree type (dummy coded), GMAT scores, undergraduate average, WGCTA total scores, SEI scores, communication anxiety scale scores and assertion scale scores. The outcome variables were final grades in the two courses. (Intercorrelations of these variables can be found in Appendices L and M).

Table 5 presents Multiple R and beta values for the four regression analyses. The independent variables taken together significantly predicted the outcome variable in three of four analyses. Only for the final Marketing participation grade were the independent variables not significant predictors. For the final Finance participation grade, there was a significant overall regression effect due to academic background and social-cognitive variables in combination, $R=.59$, $F(9,46)=2.79$, $p<.01$. This indicates that 35% of outcome variance was accounted for by academic background and social cognitive variables. As in the previous analyses, it can be seen that having an Engineering degree, undergraduate average, and WGCTA total scores account for a significant

Table 4

Multiple Regression Analyses of Final Grades on Social-cognitive Measures

	Outcome variables							
	Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
Predictor Variables	Beta	t	Beta	t	Beta	t	Beta	t
SEI score	-.24	-1.62	-.15	-.97	-.04	-.27	-.02	-.11
WGCTA total score	-.32	-2.40*	-.23	-1.68	-.16	-1.11	-.23	-1.66
Assertiveness Response Probability score	.05	.34	.01	.08	-.04	-.25	.03	.20
Communication Anxiety total score	.08	.52	.18	1.15	-.14	-.89	.23	-1.44
	R=.38		R=.30		R=.24		R=.30	
	F=2.21		F=1.30		F=.76		F=1.28	

*$p<.05$

Note: SEI= Coopersmith Self-esteem Inventory
WGCTA= Watson-Glaser Critical Thinking Appraisal

Table 5
Multiple Regression of Outcome Measures on Social-cognitive and Academic Background Variables

	Outcome variables							
	Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
Predictor	Beta	t	Beta	t	Beta	t	Beta	t
Undergraduate Major								
Engineering Degree	.46	2.95*	.48	3.30*	.02	.10	-.03	-.21
Social Science Degree	.34	2.17*	.04	.26	.11	.65	.38	2.33*
Commerce Degree	.34	2.23*	.18	1.24	.31	1.84	.30	.06
Total GMAT score	-.22	-1.67	.11	.83	-.28	-1.84	-.15	-1.03
Undergraduate average	.29	2.25*	.29	2.39*	.19	1.36	.24	1.8
WGCTA total score	.35	2.56*	.09	.69	.31	2.05*	.36	2.53*
SEI score	.17	1.19	.04	.27	.02	.14	.04	.25
Assertiveness Response Probability score	.03	.24	-.05	-.46	.05	.31	.11	.79
Communication Anxiety total score	.01	.06	.11	.76	-.20	-1.22	-.27	1.80
	R=.59		R=.65		R=.46		R=.55	
	F=2.79*		F=3.80*		F=1.33		F=2.22*	

*p<.05

Note: WGCTA-Watson-Glaser Critical Thinking Appraisal
SEI-Coopersmith Self-esteem Inventory

percentage of the variance in participation grades. However, in this analysis it can also be seen that having either a Social Science degree or a Commerce degree was also a significant predictor of the final Finance participation grade.

Again, one explanation for this discrepancy is that beta coefficients are partial regression coefficients (Pedhazur, 1982), which means that they are not the exact equivalent of the original independent variable. Instead, they are what remains once the effects of the other independent variables are partialled out or held constant. This can lead at times to some confusing results such as that which is found in this analysis. The clearest indication of the contribution of degree type to grades probably occurred in the earlier analysis where degree type alone was entered into the standard regression equation.

For the final Finance course grade, the multiple R was equal to .65 with academic background and social-cognitive measures collectively accounting for 42% of outcome variance. Again, as in previous analyses the beta values showed that the significant predictors were Engineering degree and undergraduate grades. Similar to previous analyses, none of the social-cognitive measures singularly contributed significantly to the outcome variance.

For the final course grade in Marketing, the multiple R was .55, with academic background and social-cognitive variables in combination accounting for 30% of outcome variance. The results of this analysis differed from the previous ones in that this time the beta values indicated that the significant predictors were having a Social Science degree and WGCTA total scores.

In summary, the results of the significant analyses indicate that when academic background variables are statistically controlled, WGCTA total scores account for a significant percentage of the variance in final Marketing course grades and in final Finance participation grades. None of the other social-cognitive measures contributed to outcome variance in any of the four dependent variables (see Note 1).

WGCTA subtest scores and grades. To further explore the role of critical thinking in determining course grades, additional multiple regression analyses were performed in which the predictor variables were WGCTA subtest scores and the outcome measures were final grades. Contrary to expectations, the results in Table 6 show that in none of the analyses did the predictor variables collectively accou · for significant outcome variance. For both Marketing and Finance participation grades there were significant individual beta values for evaluation. For the final Finance course grade, the beta value for interpretation was also significant. Again although a trend seems evident, caution must be exercised here because the overall F's for the analyses were not significant. In summary, the hypothesis that WGCTA subtest scores would be predictive of final grades was not supported.

Relationship of Student In-Class Behaviours to Course Grades

The next set of regression analyses tested for relationships between measures of student classroom participation, derived from content analysis of the six videotaped classes, and final Marketing and Finance course grades.

Frequency and length of speaking. Hypothesis 3 predicted that students who spoke more frequently and at greater length in class would

Table 6

Multiple Regression Analyses of Final Grades on WGCTA Subtest Scores

	Outcome variables							
	Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
WGCTA Subtest Predictors	Beta	t	Beta	t	Beta	t	Beta	t
Inference	.19	1.-2	.13	.92	.22	1.53	.21	1.44
Recognition of Assumptions	-.09	-.59	.13	.85	.01	.04	.16	1.07
Deduction	.04	.23	-.07	-.45	-.23	-1.5	-.25	-1.69
Interpretation	.19	1.43	.27	2.00*	-.09	-.66	-.07	-.49
Evaluation of Arguments	.30	2.10*	-.01	-.09	.31	2.14*	.23	1.61
	R=.36		R=.36		R=.38		R=.38	
	F=1.51		F=1.50		F=1.76		F=1.67	

*$p<.05$

Note: WGCTA= Watson-Glaser Critical Thinking Appraisal

achieve higher grades in the course where this participation took place. A series of hierarchical regressions were performed where academic background and social-cognitive measures were entered on the first step prior to entering either the frequency or length of speaking into the analysis. Hierarchical regressions were performed to control for possible intercorrelation of student characteristic variables with classroom participation variables. The student characteristic variables were degree type (dummy coded), total GMAT score, undergraduate academic average, WGCTA score, SEI score, assertiveness response probability scale score and communication anxiety score. On the second step, either the participants' total frequency or total length of speaking (in seconds) in a specific course was entered into the analysis. For example, the frequency of speaking in Marketing over the three taping sessions was summed together to obtain the total frequency of speaking in that course. The outcome measures were final grades in the two courses.

In the first four regression analyses, the process variable was frequency of speaking. As can be seen in Table 7, multiple $\underline{R}$'s were significant for final course grades in Finance, but not in Marketing. For the final participation grade in Finance, there was a significant regression effect due to all predictor variables, $\underline{R}$=.59. This result indicates that 35% of the outcome variance can be accounted for by the predictor variables. It can be seen that undergraduate academic average and frequency of speaking in Finance class accounted for a significant percentage of the variance in Finance participation grades.

Contrary to previous analyses, having an Engineering degree did not

Table 7

Multiple Regression Analyses of Final Grades on Frequency of Speaking with All Other Predictors Controlled

	Outcome variables							
	Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
Predictor Variables	Beta	t	Beta	t	Beta	t	Beta	t
First step								
Engineering Degree	.35	1.36	.74	2.99*	-.33	-1.21	-.71	-2.67*
Social Science Degree	-.22	-.83	-.64	-2.55*	.02	.06	.50	1.83
Commerce Degree	-.04	-.17	-.15	-.65	.34	1.24	.14	.53
Total GMAT score	-.08	-.59	.19	1.38	-.22	-1.48	-.09	-.62
Undergraduate Average	.31	2.41*	.31	2.50*	.18	1.32	.25	1.87
WGCTA total score	.25	1.81	.03	.21	.22	1.54	.28	1.96
SEI score	.11	.80	.01	.04	.07	.43	.06	.38
Assertiveness Response	-.03	-.24	-.09	-.67	.08	.55	.13	.93
Communication Anxiety	-.01	-.05	.09	.65	-.20	-1.27	-.29	-1.85
Second Step								
Frequency of Speaking	.35	2.78*	.17	1.39	.29	2.11*	.19	1.40
	R=.59		R=.63		R=.51		R=.54	
	F=2.46*		F=3.08*		F=1.62		F=1.92	

*p<.05

emerge as a significant predictor of the final participation grade in Finance. One reason for this may be the presence of multicollinearity. Pedhazur (1982) suggests that in nonexperimental research, correlations between the independent variables may be difficult to avoid. Furthermore, in analyses with more than two independent variables examining the correlations between variables may not be sufficient to detect multicollinearity. When this occurs the beta coefficients associated with a particular concept are split among the variables, none of which may emerge as significant in the analysis.

For the final Finance course grade, the multiple R was equal to .63, with predictor variables collectively accounting for 40% of the outcome variance. It may be noted that having an Engineering or Social Science degree and undergraduate average were significant predictors of final course grades. However, the beta value for frequency of speaking in Finance class was not significant in this analysis. Frequency of speaking had a significant beta coefficient for final Marketing participation grade. However, the overall regression analysis was not significant.

Table 8 presents Multiple R and beta values for the four regression analyses in which the process variable was total length of speaking (in seconds) in either Finance or Marketing classes. It can be seen that the independent variables taken collectively significantly predicted the outcome variable in three out of four analyses. Furthermore, the individual beta value for length of speaking was also significant in three of four analyses. For the final Finance participation grade, there was a significant overall regression effect due to the predictor

Table 8

Multiple Regression Analyses of Length of Speaking on Final Grades

	Outcome variables							
	Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
Predictor Variables	Beta	t	Beta	t	Beta	t	Beta	t
First step								
Engineering Degree	.48	1.89	.77	2.98*	-.33	-1.21	-.71	-2.70*
Social Science Degree	-.26	-1.02	-.63	-2.49*	.04	.15	.53	2.02*
Commerce Degree	-.12	-.52	-.18	-.76	.31	1.17	.10	.38
Total GMAT score	-.04	-.32	.18	1.32	-.20	-1.42	-.07	-.50
Undergraduate Average	.26	2.09*	.30	2.36*	.17	1.30	.24	1.84
WGCTA total score	.23	1.77	.03	.21	.23	1.66	.28	2.03*
SEI score	.14	1.04	.02	.15	.05	.35	.06	.38
Assertiveness Response	.01	.09	-.07	-.49	.07	.47	.13	.92
Communication Anxiety	.04	.27	.11	.73	-.19	-1.22	-.27	-1.82
Second Step								
Length of speaking	.44	3.46*	.14	1.07	.34	2.61*	.27	2.16*
	R=.63		R=.63		R=.54		R=.58	
	F=3.02*		F=3.00*		F=1.91		F=2.28*	

p<.05

variables collectively, R=.63. This indicates that 40% of the variance in final participation grades was due to the predictor variables. In particular, individual beta values indicate that length of speaking and undergraduate average accounted for most of the criterion variance. Although the overall multiple R was significant for the final Finance course grade, the individual beta value for length of speaking was not.

For the final Marketing course grade, R was .58, indicating that 33% of the variance was due to academic background variables, social-cognitive measures and classroom participation variables in combination. The beta values which accounted for most of the criterion variance were length of speaking, Watson-Glaser critical thinking scores, and having an Engineering or Social Science degree. Although the beta value for length of speaking was significant for final Marketing participation grade, the overall R was not.

Hypothesis 4 predicted that students' frequency and length of speaking in the two courses would be related to academic background variables and to the social-cognitive measures. To test this hypothesis, hierarchical regressions were performed with degree type (dummy coded) entered on the first step, total GMAT score and undergraduate averages entered on the second step, social-cognitive measures entered on the third step, and length or frequency of speaking as the dependent variable. Academic background variables were entered on the first two steps to statistically control for their effects on the social-cognitive measures. Academic background variables were always entered on the first step of the analyses so that all analyses would be consistent. The results of these analyses revealed that in no case were academic

background variables and social-cognitive measures predictive of the overall frequency or length of speaking in either course.

The results of these analyses suggest that, in general, students' frequency and length of speaking were predictive of participation grades and final course grades. However, contrary to hypothesis, students' length or frequency or speaking could not be predicted from academic background or social-cognitive measures. To clarify the role of student in-class speaking behaviours, the next analyses focus on the content or nature of these behaviours.

Problem-solving component scores. Hypothesis 5 stated that students who exhibit certain problem-solving behaviours in classroom discussion would be likely to have higher participation and final course grades. To examine this hypothesis, four standard multiple regression analyses were performed in which the predictor variables were the eight problem solving components derived from content analysis of classroom interaction (e.g. states strategies), and the criterion variable was one of the final grade measures. It will be recalled that each student's responses in the six videotaped classes were analyzed for the frequency of each of eight problem solving components: answers a factual question (ANS), states the problem (PS), states the case issues (PI), performs numerical analysis (NUM), states strategies (ST), uses elaboration (EL), states a reason (RN), evaluates strategies or plans (EV).

Table 9 shows that collectively the predictor variables were able to significantly predict only the final Marketing participation grade. The multiple R in this case was .53, indicating that problem-solving components accounted for 28% of criterion variance. It may be noted that

Table 9

Multiple Regression Analyses of Final Grades on Problem-solving Components

	Outcome variables							
	Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
Problem solving components	Beta	t	Beta	t	Beta	t	Beta	t
Answer	.09	.46	.13	.69	.19	.61	.26	.81
Problem Statement	-.11	-.53	-.33	-1.43	.13	.37	.18	.49
Problem Issue	.23	1.29	.03	.17	.28	1.52	.08	.45
Elaboration	-.04	-.15	-.11	-.40	.79	1.63	.94	1.88
Strategies	.13	.58	.15	.59	-.27	-.64	-.78	-1.82
Numerical analysis	.07	.41	.08	.49	-.11	-.53	.05	.21
Reason	-.03	-.09	.22	.69	.01	.01	.07	.15
Evaluation	.19	.55	-.12	-.32	-.50	-1.00	-.43	-.86
	R=.42		R=.29		R=.53		R=.48	
	F=1.29		F=.09		F=2.28*		F=1.77	

*p.<.05

although the overall R was significant, none of the individual beta values was significant. In interpreting this apparent anomaly, it is important to recall that the test of R is the equivalent of testing all the *b*'s collectively. When individual *b*'s are tested for significance, the test determines whether the individual *b* is significantly different from zero "while statistically controlling for the effects of other independent variables" (Pedhazur, 1982, p.59). Pedhazur states that when the independent variables are highly correlated the standard errors of the *b*'s become relatively large. Thus, when each of the regression coefficients is tested separately all of them may turn out to be statistically nonsignificant despite the fact the multiple R is statistically significant. As there is a high degree of correlation among the problem-solving components (mean interitem correlation=.72, see Appendix N for the full correlation matrix), this may well be the case.

Cognitive level of student responses. Hypothesis 6 postulated that students who demonstrated higher cognitive level responses in case discussions would be likely to achieve higher grades. Multiple regression analyses were performed with length or frequency of low and high cognitive level responses as the independent variables and final grades as the dependent variables. It will be recalled that student responses were classified as either high or low in cognitive level, and in addition, each type of response was timed (in seconds). Next, the frequency and total length of high and low level responses were computed for each taping session. Finally, total frequency and total length of time scores for high and low level responses for each course were

computed by summing over the three taping sessions.

The frequency of high and low level cognitive responses significantly predicted final participation grades in Marketing and Finance, but not final course grades. As shown in Table 10, the cognitive level variables in combination showed a multiple R of .33 with final participation grade in Finance. Therefore, 11% of the criterion variance could be accounted for by the predictor variables. However, individually neither of the beta values was significant. When the final Marketing participation grade was regressed, the R of .36 showed that 13% of the outcome variance was due to the predictor variables collectively. Again, neither of the individual beta values was significant.(Appendix O shows the correlations between type of student response and course grades).

Similarly, when multiple regression analyses were performed with total duration of high and low level responses as the independent variables and final grades as the dependent variable, it was found that cognitive level was again predictive of participation grades but not of final course grades. As can be seen in Table 11, duration of high and low level responses was predictive of the final Finance participation grade, R =.39. Therefore, 14% of the variance in the criterion variable could be accounted for by the predictor variables. The beta value which accounted for most of the criterion variance was length of high level responses. Final Marketing participation grades could also be predicted by length of high and low level responses in combination, R=.41. This result indicates that 17% of the variance in the final marketing participation grades could be accounted for by the predictor values.

Table 10

Multiple Regression Analyses of Grades in Relation to Frequency of High and Low Cognitive Level Responses

	Outcome variables			
	Final Finance Participation Grade	Final Finance Course Grade	Final Marketing Participation Grade	Final Marketing Course Grade
Cognitive Level Frequency Variable	Beta t	Beta t	Beta t	Beta t
High Level Responses	.13 .83	-.15 -.95	.31 1.12	.39 1.36
Low Level Responses	.25 1.63	.19 1.17	.06 .22	-.15 -.52
	R= .33 F= 3.38*	R=.16 F=.75	R= .36 F= 4.05*	R=.27 F= 2.04

*p <.05

Table 11

Multiple Regression Analyses of Grades in Relation to the Duration of High and Low Cognitive Level Responses

	Outcome variables							
	Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
Cognitive Level Time Variable	Beta	t	Beta	t	Beta	t	Beta	t
High level responses	.33	2.55*	-.03	-.21	.22	1.16	.34	1.68
Low level responses	.16	1.23	-.02	-.14	.22	1.14	-.03	-.13
	R=.39 F=4.71*		R=.04 F=.04		R= .41 F=5.59*		R=.32 F=3.02	

*p <.05

However, neither of the beta values for the individual predictor variables was significant in this case.

Cognitive level of teacher's questions. Hypothesis 7 predicted that the cognitive level of teachers' questions would affect students' grades, such that students who received higher cognitive level questions would be more likely to have higher grades. To investigate this hypothesis, multiple regression analyses were performed with frequency of teacher questions at low and high cognitive levels as predictor variables, and final grades in each course as outcome variables. Students received separate scores for high or low cognitive level questions for each course, reflecting the total number of times in the taped classes that they were asked each question type in each course.

It was found that the cognitive level of teacher questions was significantly related to participation grades in Marketing and Finance, but not to final course grades in either course. As can be seen in Table 12, cognitive level of teacher questions predicted final Finance participation grade, with R equal to .38, indicating that 15% of the outcome variance was due to the cognitive level of the teacher questions. The beta values indicate that the majority of this variance was due to low cognitive level questions.

Similarly, cognitive level of the teacher questions significantly predicted the final Marketing grade for participation, R = .37, indicating that 13% of the outcome variance was due to the predictor variables. Again, the beta values indicate that most of this variance was due to low level teacher's questions. Although the cognitive level of teacher questions predicted participation grades in both courses, the

Table 12

Multiple Regression Analyses of Final Grades in Relation to the Cognitive Level of Teacher's Questions

Frequency of Teacher Questions	Outcome variables: Final Finance Participation Grade		Final Finance Course Grade		Final Marketing Participation Grade		Final Marketing Course Grade	
	Beta	t	Beta	t	Beta	t	Beta	t
Low Cognitive Level	.48	2.54*	.25	1.23	.36	2.24*	.19	1.11
High Cognitive Level	-.14	-.77	-.26	-1.32	.01	.04	.04	.26
	R=.38		R=.18		R=.37		R=.22	
	F=4.58*		F=.94		F=4.19*		F=1.37	

*p<.05

type of question that was predictive of grades was low rather than high level questions. Therefore, the hypothesis that students who were asked high level cognitive questions would have higher grades was not supported.

Gender Effects

Hypothesis 8 stated that women would be asked fewer high level cognitive questions than men and that this difference would be more pronounced in Finance. To test this hypothesis a repeated measures MANOVA was performed, with course as a within-subjects independent variable, gender as a between-subjects independent variable, and frequency of teacher questions at low and high cognitive levels as dependent variables. No gender or gender by course interaction was found in the MANOVA. Therefore, the hypothesis was not supported.

It was also postulated that male students would speak more frequently and at greater length in both courses. To test this hypothesis, a MANOVA was performed with student gender as a between-subjects variable, and total time of talking and frequency of talking as dependent variables. No gender main effect was found. Therefore it does not appear that gender influenced either the type of teacher question asked or the frequency or length of student talking in class.

Finally, independent-groups t-tests were performed comparing male and female participants' grades in the two courses. The only significant finding occurred in the comparison of male and female students final Finance participation grades, where the mean participation grade for female students ($M=5.67$) was significantly lower than the the mean participation grade for male students ($M=7.76$), $t(55)=2.47$, $p<.02$. This

result is difficult to explain in that the MANOVAs with gender as a between-subjects independent variable and cognitive level of students' responses (high/low) or problem-solving components as dependent variables yielded no significant effects due to gender or gender by course interaction. In other words, whereas earlier analyses found no difference for variables that are correlated with participation grade, the present analysis found a difference for the participation grade itself.

Analysis of Problem-solving Components

The second major goal of the present study was to investigate the frequency and distribution of problem-solving skills in case method classes. Little research has been performed to explicitly examine the classroom dialogue that shapes the case analysis. Although the purpose of the case method is to teach problem-solving skills, few studies have examined the students' verbal demonstration of problem-solving skills. What types of problem-solving skills do MBA students demonstrate in class? Does their problem-solving ability improve over time? Does the type of problem-solving skills vary by the type of course? All of these questions will be discussed in the next section.

Frequency of Problem-solving components. The first step was to compute descriptive statistics on the problem-solving components. Table 13 shows the number and percentage of participants who utilized each of the eight problem-solving components at least once over the six classes, plus the mean frequency of use and standard deviation of each component. It was found that three of the 58 students never spoke a word in any of the videotaped classes. As shown in Table 13, students who did speak

Table 13

Number and Percentage of Students Using Each of the Problem-solving Components at Least Once in All Six Classes Combined, Plus the Mean and Standard Deviation of Frequency of Use of Each Component

Problem Solving Components	Number of Subjects	Percentage of Subjects	Mean Frequency of Occurrence (SD)
Answer	48	82.76	4.38 (5.64)
Problem statement	49	84.50	5.10 (6.15)
Problem Issue	49	84.50	3.79 (3.34)
Numerical analysis	16	27.59	1.19 (3.39)
Strategies	46	79.31	5.53 (10.49)
Elaboration	53	91.38	11.62 (16.04)
Reason	51	87.93	7.19 (10.13)
Evaluation	52	89.66	8.00 (9.38)

employed the problem-solving components differentially in their responses. Almost all student participants used elaboration, and it was also the most frequently occurring problem-solving component in student utterances. With one exception, approximately 80% of the subjects used all of the other problem-solving components at least once in their utterances in class. The only problem-solving component that was seldom used was numerical analysis. Only sixteen participants used this component at least once.

Effects of time of testing and subject matter. Hypothesis 9 predicted that both time of testing (early, middle, or end of year) and subject matter would influence students' use of the eight problem-solving components. Specifically, it was postulated that as the year progressed, students would show an increase in ability to identify issues in cases, because problem definition is a key focus of novice problem-solvers. Also, it was posited that students would use abstract reasoning more in the hard knowledge Finance course than in Marketing classes.

To test these predictions, a repeated measures MANOVA was performed with time and course as within-subject independent variables and scores on the eight problem solving components as dependent variables (3 x 2 within-subjects design with eight dependent variables). The SPSS MANOVA program was used for the analyses. Based on Hotellings' T criterion, the combined dependent variables were significantly affected by Course, $F(8,50)=3.75, p<.002$ and by Time, $F(16,212)=2.28, p<.004$. There was also a significant interaction between time and course, $F(16,214)=2.08, p<.01$. Inspection of the data revealed that more problem-solving components

were used in Marketing than in Finance, more components were used later than earlier in the year, and that as the year continued differences between the two courses decreased. Table 14 shows univariate F's for the main effect of course. It can be seen that there were significant univariate F's for both problem statement and problem issue, with both components more likely to occur in Marketing (M's =1.06 and .82 respectively) than in Finance (M's=.63 and .45). These results support the hypothesis that in Marketing classes, more emphasis was placed on concrete issues rather than on the development of abstract conceptual skills.

Table 15 shows univariate F's for the main effect for time. In this analysis only the univariate F for problem issue was significant. Post hoc comparisons using the Tukey HSD (a conservative post hoc test) of Time 1 with Time 2, Time 3 with Time 1, and Time 3 with Time 2 indicated that there was a significant increase in problem issue scores from Time 2 to Time 3, Q(116)=4.537, p.<.01. There were no significant univariate F's for the interaction of Time and Course.

Cognitive Level of Responses in Relation to Course and Time of Testing

Hypothesis 10 stated that the cognitive level of student utterances would be significantly affected by Course and Time of Testing. With each student response coded as either low or high cognitive level, it was hypothesized that as the year progressed, students would show a greater frequency of higher level cognitive responses and these responses would be longer in duration. In other words, it was expected that there would be a relationship found between time of year and the cognitive level of the response. Furthermore, this trend was expected to be stronger in

Table 14

Univariate Effects of Type of Course on Problem-Solving Components

Variables	MS	df	Univariate F	p
Answer	8.38	(1,57)	1.77	.19
Problem Statement	15.74	(1,57)	4.43	.04*
Problem Issue	11.77	(1,57)	6.92	.01*
Numerical Analysis	.65	(1,57)	.35	.56
Strategies	2.10	(1,57)	.39	.53
Elaboration	38.67	(1.57)	2.06	.16
Reason	.03	(1,57)	0.00	.95
Evaluation	1.39	(1,57)	.21	.65

* p is significant

Table 15

Univariate Effects of Time of Year on Problem-Solving Components

Variables	MS	df	F	p
Answer	6.38	(2,114)	1.26	.29
Problem Statement	1.05	(2,114)	.21	.81
Problem Issue	8.04	(2,114)	5.16	.007*
Numerical Analysis	1.72	(2,114)	.89	.41
Strategies	6.63	(2,114)	.67	.51
Elaboration	19.61	(2,114)	.78	.46
Reason	4.1^	(2,114)	.45	.64
Evaluation	2.37	(2,114)	.28	.76

*p.<.05

Finance classes than in Marketing classes.

To test these predictions, two repeated measures ANOVAs were performed. In both analyses, time of testing, course, and cognitive level were within-subjects independent variables and frequency and duration of low and high level responses were the dependent variables. In the first analysis, length of responses (in seconds), was the dependent variable, whereas in the second analysis, frequency of response at each cognitive level was investigated. The interaction between course, time and cognitive level was of particular interest in these analyses.

The first ANOVA yielded a nonsignificant main effect for Time and a nonsignificant interaction of Course X Time X Cognitive Level. However, there was a main effect for Cognitive Level, $F(1,57)=22.09$, $p<.05$. Overall, high cognitive level responses were much longer in time ($M=28.91$ seconds) than low level responses ($M=8.06$ seconds).

The second ANOVA revealed a significant two-way interaction between Course and Cognitive Level, $F(1,57)=17.31$, $p<.05$. As can be seen in Figure 1, low cognitive level responses occurred more frequently in Marketing than in Finance. However, the hypothesized Cognitive Level X Time interaction did not occur.

The results of these analyses lend limited support to relevant hypotheses. Although time of the year was not found to affect level of student responses, course did have a significant effect on the cognitive level of students utterances. As postulated, low level responses occurred more frequently in the Marketing class than in the Finance class. The longer length of higher level responses was to be expected as

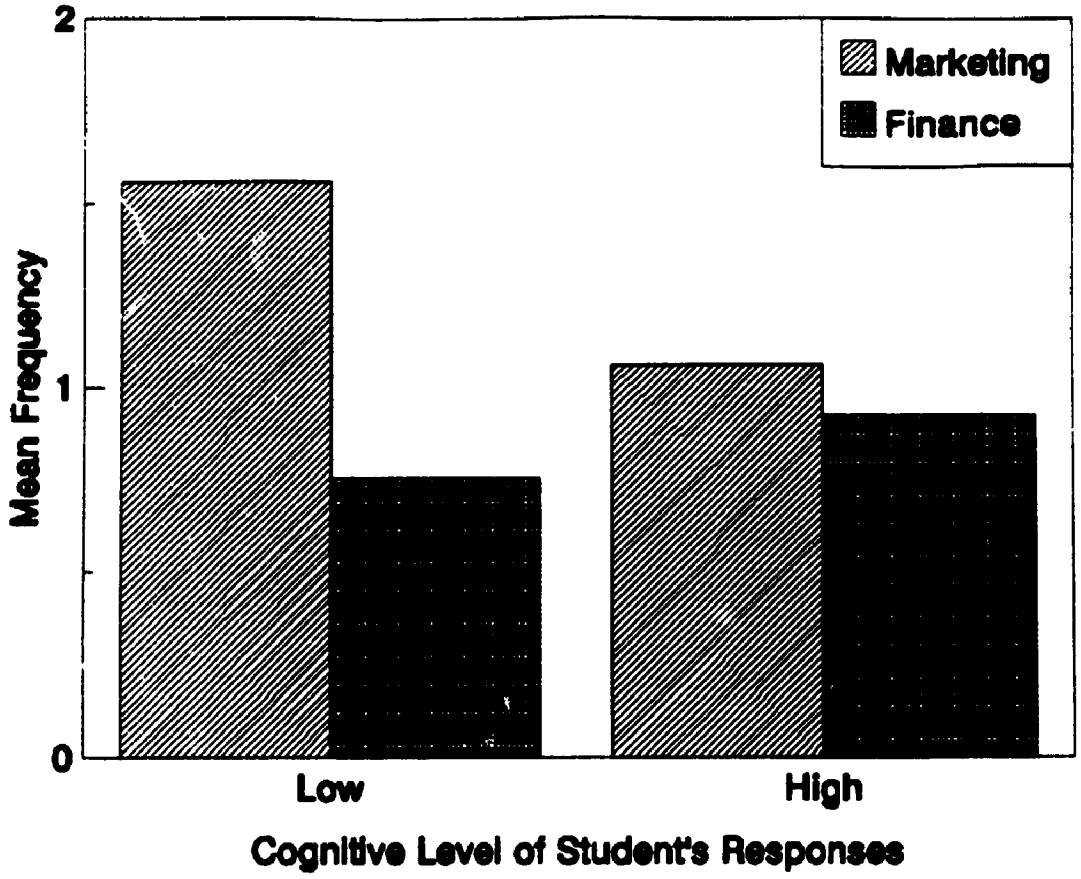


Figure 1. Frequency of responses at two cognitive levels in Marketing and Finance.

responses requiring synthesis and evaluation of information will take longer than brief, factual, low level, cognitive responses.

Congruence of Cognitive Level in Teacher-Student Interaction

A final focus of the present research was on the congruence between cognitive level of teacher questions and cognitive level of student responses. Hypothesis 11 predicted that there would be a strong relationship between the cognitive level of teacher questions and that of student responses. Each subject received four scores for each course (i.e., high level question/high level response, high level question/low level response, low level question/low level response, low level question/ high level response) indicating the number of times the students response matched or did not match the cognitive level of the teacher question (high or low). These data were summed over the three taping times. Table 16 shows the percentage of time the cognitive level of student response matched or did not match the cognitive level of teacher question. It can be seen that in both courses, student responses were more likely to match than not match the cognitive level of teacher questions. In addition, students were more likely to be asked low rather than high level cognitive questions. Students were twice as likely to match high level responses to high level questions in Finance than in Marketing.

To further investigate the congruence of the cognitive level of teacher and student responses and to determine the effect of course material on teacher questions, a 2 X 2 X 2 ANOVA was executed with course (Finance/Marketing), congruence level of question (Match/No match) and cognitive level of teacher questions (high/low) being within

Table 16

Percent Congruence between Teacher Questions and Student Responses in Finance and Marketing

Congruence of Questions and Answers (Percentage out of 100)	Marketing	Finance
Match		
High Cognitive Level Question and Answer	10.62	21.15
Low Cognitive Level Question and Answer	54.32	40.5
No Match		
High Cognitive Level Question and Low Level Answer	6.42	3.94
Low Cognitive Level Question and High Level Answer	28.64	34.41

subjects independent variables, while total frequency of responses over the three time periods was the dependent variable.

The results indicated a main effect for congruence of questions and answers, $F(1,57)=20.58$, $p<.0001$, and a main effect for cognitive level for teacher questions $F(1,57)=37.96$, $p<.0001$, but no main effect for course $F(1,57)= .164$, $p=.164$. In addition, a significant two-way interaction was found between course and cognitive level of teacher's questions $F(1,57)=4.31$, $p<.05$; as well as a significant three-way interaction between course, question/answer congruence, and the cognitive level of question $F(1,57)=9.91$, $p<.003$. Each of these significant interactions will be discussed in turn below.

Figure 2 illustrates the significant interaction between course and cognitive level of teacher questions. It can be seen that high level questions were equally likely to occur in either course whereas far more low level questions occurred in Marketing than in Finance.

Figure 3 depicts the three-way interaction between course, cognitive level of teacher question, and congruence of questions and answers. Again the significant two-way interaction between course and cognitive level of question can be seen. It is also apparent that congruence of question and answer significantly interacts with these two variables (course and cognitive level), with more high level matching responses occurring in Finance than in Marketing but also more low level matching in Marketing than in Finance.

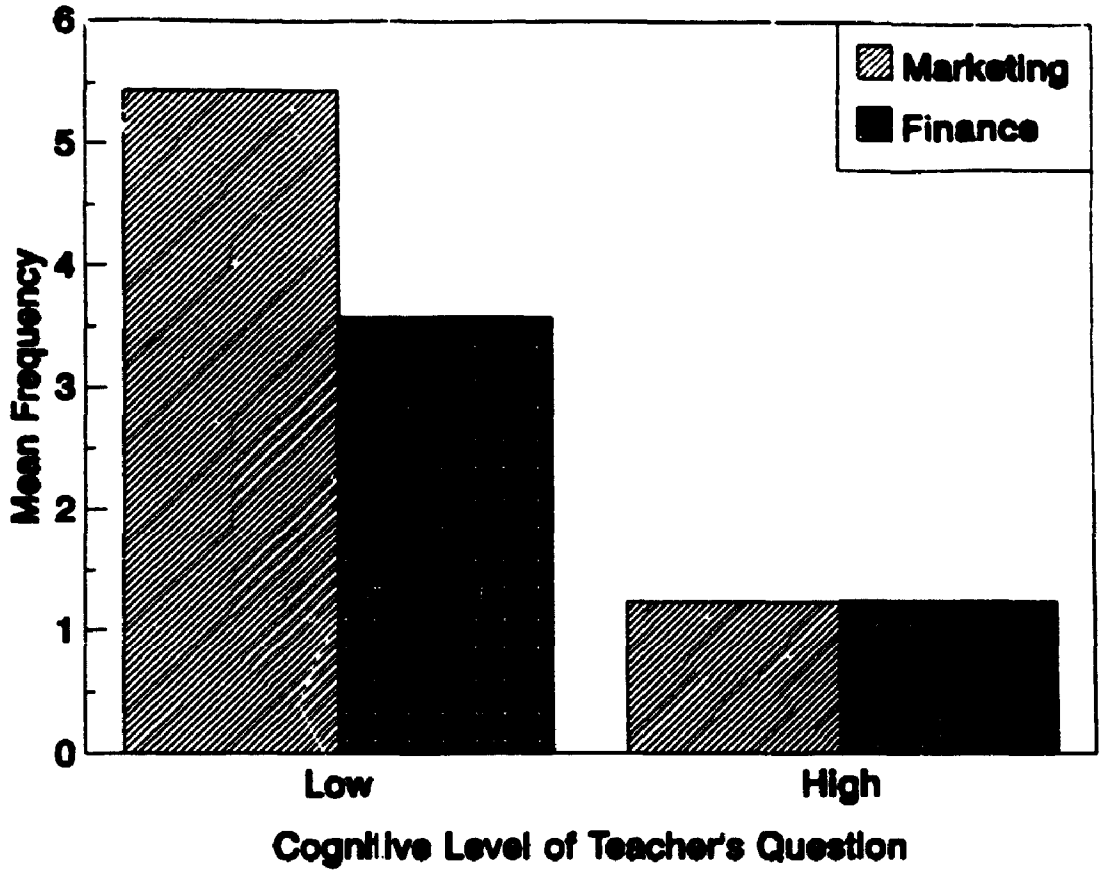
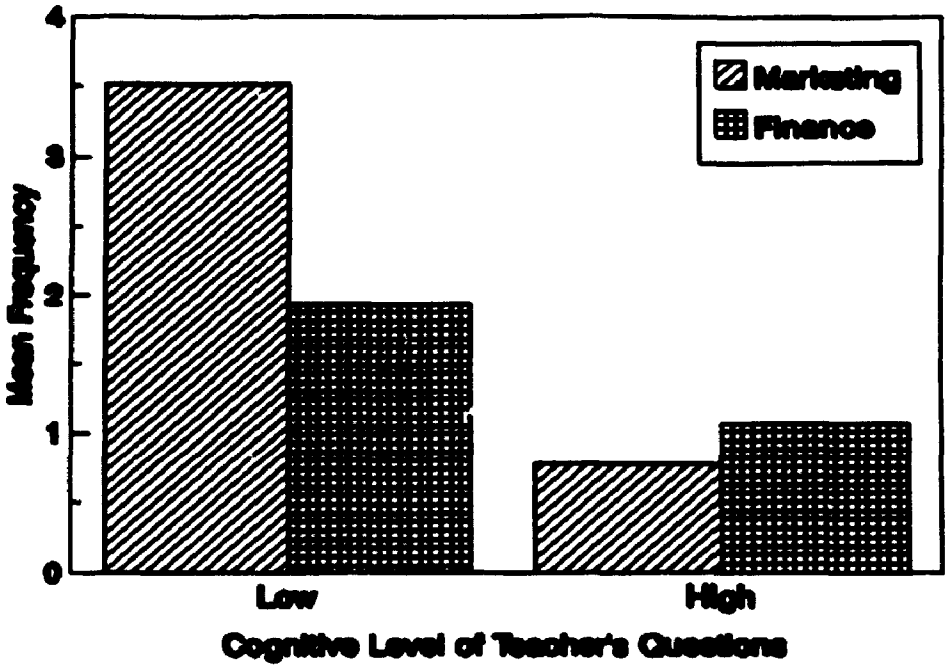
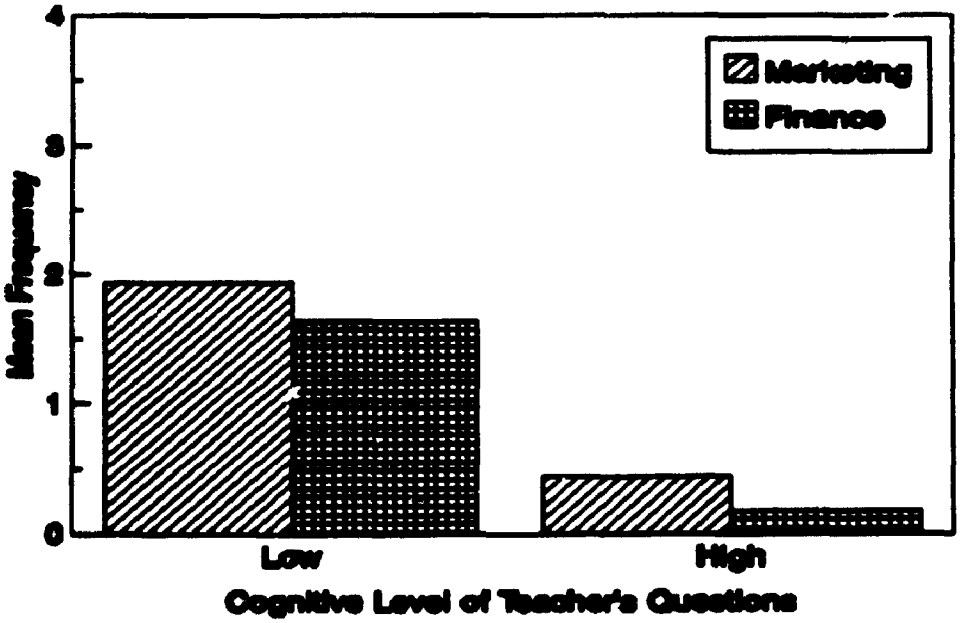


Figure 2. Two-way interaction between course and cognitive level of teacher's question.



Part 1: Matching of Teacher Questions and Student Responses



Part 2: Nonmatching of Teacher Questions and Student Responses

Figure 3. Three-way interaction between cognitive level of teacher's question, students' responses and course.

Summary of Major Results

1. Overall it was found that grades in Finance showed significant relationship to academic background variables. Specifically, it was found that degree type significantly predicted final course grades and final participation grade in Finance, with completion of an Engineering degree being significantly related to outcome variance. It was also found that undergraduate grades significantly predicted the final participation grades and final course grades in Finance. Contrary to Hypothesis 1, none of the Marketing grades could be predicted by academic background variables.

2. By themselves, the social-cognitive measures were not consistently predictive of grades in either Marketing or Finance. When the effects of academic background variables were statistically controlled, it was found that critical thinking (as measured by Watson-Glaser scores) accounted for significant outcome variance in final Marketing course grade and final Finance participation grade. However, self-esteem, communication anxiety, and assertiveness were not found to be related to final grades in the two courses when academic background variables were statistically controlled.

3. Partial support was found for the hypothesis that grades would be significantly related to length and frequency of speaking in class. For Finance, final participation grades were significantly

related to length of speaking. Final Marketing course grade was also significantly related to length of speaking in class, and final Finance participation grade was related to frequency of speaking.

4. Contrary to Hypothesis 4, it was not found that frequency or length of speaking in either course could be predicted by academic background or social-cognitive measures.

5. The hypothesis that problem-solving component scores would significantly predict final grades in Marketing and Finance was only partially supported. Final Marketing participation grades were predicted significantly by problem-solving component scores.

6. Cognitive level of student responses was related to participation grades in Finance and Marketing, but not to final course grades in either course. For the final Finance participation grade, it was found that length of higher cognitive level responses contributed significantly to criterion variance.

7. Similarly, it was found that cognitive level of teacher questions was significantly related to student participation grades in Marketing and Finance, but not to final course grades. Contrary to prediction, participation grades were significantly predicted by low level rather than high level questions.

8. Contrary to Hypothesis 8, gender did not affect the frequency or length of student responses, nor was it related to type of teacher question asked. However, gender was a significant predictor of the final Finance participation grade, with female students having significantly lower grades than male students.

9. Both course and time of testing were found to affect student use of problem-solving components in class discussions. Specifically, both problem statement and problem issue were more likely to be used in Marketing than in Finance. Also, problem issue scores significantly increased from November to March. However, the hypothesis that students would display more higher level problem-solving skills in Finance more than in Marketing as the year progressed was not supported.

10. Low level cognitive responses occurred more frequently in Marketing than in Finance. Contrary to expectation, no significant increase was found in high cognitive level responses over the year.

11. It was found that there was significant congruence between cognitive level of teacher questions and cognitive level of student responses. In other words, students were more likely to match than to not match the cognitive level of teacher questions. It was also discovered that in both courses more low than high level questions were asked by teachers. In addition, there was a

significant interaction between course and cognitive level of teacher questions. More low level questions occurred in Marketing than in Finance, whereas Marketing and Finance teachers asked about equal numbers of high level questions. Finally, there was a three-way interaction between course, cognitive level of teacher question, and the congruence of questions and answers. The results seemed to indicate that when students were asked a high level question they were more likely to respond with a high level response in Finance than in Marketing. The participants were more likely to match low level questions in Marketing than in Finance.

DISCUSSION

The primary purpose of this research was to investigate classroom interaction and participation in case method classrooms in a Master of Business Administration program. More specifically, the goals were first, to investigate how social-cognitive and academic background variables influence classroom participation, and second, to examine the longitudinal development of case method problem-solving skills throughout the academic year. Each of the findings will be examined in relation to previous research in the field. Finally, implications of the study for case method education will be explored along with suggestions for future research.

Relationship of Student Characteristics to Course Grades

The first two hypotheses were concerned with the relationship of student characteristics to academic outcomes (i.e., grades in the two courses). Specifically, it was hypothesized that social-cognitive and academic background characteristics of students would correlate significantly with grades in Finance and Marketing. To test this hypothesis, multiple regression analyses were performed to examine the individual and collective effects of these variables on outcome measures.

Student academic background. It was hypothesized that degree type, undergraduate grade average, and total GMAT score would be positively associated with student grades in Marketing and Finance. In particular, it was predicted that having an Engineering degree would be associated with high grades in Finance, whereas having a Social Sciences or

Commerce degree would be associated with high grades in Marketing.

These hypotheses were partially supported. Degree type was predictive of final participation and final course grade in Finance. As predicted, students with an undergraduate degree in Engineering tended to achieve better grades than students with degrees in other fields. In Marketing, degree type was not predictive of final grades. Also, it was found that final participation and course grades in Finance could be significantly predicted by undergraduate average. However, neither GMAT nor undergraduate average was significantly predictive of grades in the Marketing course.

Perhaps it is not surprising that degree type and undergraduate average were better predictors of grades in Finance than in Marketing. It may be that the mathematical problem-solving content of Engineering courses is more directly related to the course content of the Finance course. On the other hand, the more general course content of undergraduate Social Science or Commerce courses may not transfer as directly to the content of the Marketing course. Research on problem-solving suggests that two key components to successful transfer are having domain specific knowledge and having a wide variety of problem-solving skills (Silver & Marshall, 1990). Although students with either an Engineering or Commerce degree may have domain-specific knowledge relevant to MBA courses in Finance or Marketing, it is primarily Engineering students who also have learned a wide repertoire of mathematical problem-solving skills as part of their degree requirements. Therefore, it is not surprising that Engineering degrees were more specifically related to Finance grades than Commerce degrees

were to Marketing grades.

Previous research on degree type and MBA grades has not found degree type to be predictive of grade point average (Schwan, 1988). However, researchers have not examined the relationship between specific course grades and degree type. The results of the present research suggest that degree type may be a significant predictor but only for courses where the course content and learning goals specifically match the content of the undergraduate degree.

For neither Finance nor Marketing were GMAT total scores predictive of course grades. Although several researchers have found GMAT scores predictive of MBA course grades (Breaugh & Mann, 1981; McClure, Wells, & Bowerman, 1986; Schwan, 1988), others have found no correlation with grades (e.g., Benson, 1983). Similar to the present study, Benson found that there were no significant relationships between Marketing and Finance grades and total GMAT scores. Benson argues that even when GMAT scores have been found to be significantly related to MBA grades, the proportion of variance that has been accounted for is usually quite small, suggesting that other factors play a larger role in determining success for students than GMAT scores.

Social-cognitive measures. It was postulated that MBA grades in Marketing and Finance courses would be significantly related to social-cognitive measures. Specifically, students who were high in assertiveness and self-esteem, low in communication anxiety, and high in critical thinking skills were expected to have higher grades in the two courses. It was found that, taken either collectively or individually, social-cognitive measures did not contribute significantly to outcome

variables. It is interesting that the participants in the present study on average, had very high self-esteem scores, very low communication anxiety scores, and high critical thinking skills. It may be that knowledge of program requirements and the screening process for admission discourages students who do not have these attributes from applying or receiving admission to the MBA program. Restricted variation in social-cognitive measures among MBA candidates may be one of the reasons for the failure of these measures to correlate with course grades in the present study.

All of the social-cognitive and academic background measures were combined to determine whether collectively they predicted final grades in the two courses, and whether social-cognitive characteristics were related to course grades with academic background variables statistically controlled. It was found that final course and participation grades in Finance were significantly predicted by social-cognitive and academic background variables in combination. For final participation grade, degree type, undergraduate average, and critical thinking scores were all significant predictors. For final course grade, degree type and undergraduate average were significant predictors, and as hypothesized, having an Engineering degree contributed positively. In contrast to earlier analyses where social-cognitive or academic background measures were examined in isolation, final course grades in Marketing were significantly predicted by critical thinking scores and degree type. As predicted, having a Social Science degree contributed positively to final course grade in Marketing. However, in none of these analyses was assertiveness, self-esteem, or communication anxiety

found to be a significant predictor of grades.

It is interesting to note that with academic background variables statistically controlled, critical thinking skills as measured by Watson-Glaser Critical Thinking Appraisal, emerged as significant predictor of final Marketing course grades and of final Finance participation grades. Although several studies (Pascarella, 1989; Smith, 1977) have examined the acquisition of critical thinking skills in university courses, researchers have seldom directly examined the relationship between critical thinking skills and grades. The results of the present research support Foster's (1980) finding that critical thinking skills predicted grades on practice medical exams. It appears that, at least for some types of courses, critical thinking is an important predictor of grades. For final Marketing participation grades, the overall regression was nonsignificant but there was a significant individual beta for Watson-Glaser Critical Thinking Appraisal score. This suggests that while critical thinking may play a role in participation grades, other factors must be accounting for most of the variance.

Classroom participation variables

It was postulated that students who spoke longer or with greater frequency in class would have higher grades, particularly in the case of participation grades. Multiple regression was used to determine how well process variables (frequency and length of speaking) determined outcome variables (grades), with presage variables (social-cognitive and academic background measures) statistically controlled.

This hypothesis was mainly supported. Frequency of speaking was a

significant predictor of final participation grades in both courses, although only in Finance was the overall regression analysis significant. Length of speaking was a significant predictor of final participation grade in both courses and of final course grade in Marketing. Similar to previous research, these results indicate that participation in class was an important predictor of academic achievement (Tobin & Gallagher, 1987; Comadena & Prusank, 1988, Bonwell & Eison, 1991). Therefore, it seemed vital to determine whether social-cognitive measures could predict who would speak in class.

It was predicted that participants with low communication anxiety, high assertiveness, high self-esteem, and strong critical thinking skills would tend to speak more frequently or at greater length. Contrary to this hypothesis, no evidence was found that frequency or length of speaking could be predicted from social-cognitive measures. These variables may still be important in determining who will speak in a general university population, but the scores for MBA students may be somewhat restricted and therefore preclude the possibility of demonstrating their significance in the present study.

Overall, the analyses of frequency and length of speaking in class suggest that class participation is an important variable in determining academic achievement. Therefore, it seems imperative to investigate what components of participation are directly related to student learning. The next set of analyses examined whether use of problem-solving skills during discussion was related to student grades in the two courses.

Problem-solving component scores. It was hypothesized that students who showed certain problem-solving behaviours in class discussion (such

as problem issue, strategies, or evaluation) would tend to achieve higher participation and final course grades. Partial support was found for this hypothesis in that students who exhibited more problem-solving skills had higher Marketing participation grades. However, problem-solving skills were not related to any other outcome measure, and even for Marketing participation grades none of the individual problem-solving components emerged as significant. In this case, it may be that the high degree of intercorrelation among the variables decreased the chance of finding any single significant component. The next set of analyses examined problem-solving at a more general level. Participants' responses were analyzed to determine if they were high or low in cognitive level.

Cognitive level of student responses. It was postulated that students who showed higher cognitive level utterances would achieve higher final grades. The predictor variables in these analyses were frequency or duration of low and high level responses. Partial support was found for higher grades in relation to frequency of low and high level cognitive variables in combination. Similarly, when the predictor variables were duration of high and low level responses in combination, these variables significantly predicted final participation grades in the two courses. For the final Finance participation grade, length of high level utterances accounted for most of the criterion variance. This finding is important because it suggests that students who were more capable of higher level reasoning such as evaluation, and development of strategies received higher participation grades in Finance. Because the cognitive level of student responses is likely to be related to the type

of question they are asked, the next set of analyses investigated the relationship between the cognitive level of teacher questions and student grades.

Cognitive level of teacher's questions. It was hypothesized that students who were asked more high than low level teacher questions would have higher final grades in the two courses. Although cognitive level of teacher questions did predict participation grades in both courses, it was low rather than high level questions that contributed positively to grades. Therefore, the hypothesis that students who were asked high level questions would have higher grades was not supported. Tobin and Capie (1982) mention that results of studies of higher cognitive level questions have not been consistent. Not all studies have found a positive relationship between achievement and higher cognitive level questions. There are several explanations that may account for these results. First, it may be that students who are good participators tend to be asked lower level cognitive questions at the beginning of the class to get the discussion moving. High level questions require longer wait times for students to formulate a response (Goodwin, Sharp, Cloutier, Diamond, & Dalgaard,1983). For faculty who are trying to generate a fast moving discussion, asking lower level questions may appear expedient.

Second, faculty may reward students for simply responding quickly to their questions and may not always critically evaluate their responses. Faculty did ask more low than high level questions and may have given marks at times to students who responded to their low cognitive level questions. Several other researchers have found that

even at the university level, faculty tend to ask more low than high level questions (Barnes, 1975; Foster, 1980).

Third, as Tobin and Capie (1982) suggest, higher level questions are of little importance if they do not cause the student to engage in higher level thinking. To determine if this is occurring, it is necessary to examine the cognitive level of the students' responses. The congruence between teacher questions and student responses was examined in the present study and the results will be discussed in a later section of the discussion.

Gender Effects

A series of analyses examined the relationship of gender to student participation in the classroom. It was postulated that men would be asked more high level cognitive questions than women and that this would occur more so in Finance than in Marketing classes. Contrary to prediction, a repeated measures MANOVA yielded no main effect of sex nor sex by course interaction. It was further hypothesized that men would speak more frequently and at greater length in the classroom than women. Again, no evidence was found to support this hypothesis. The results, therefore, indicated that gender influenced neither teacher questions nor the frequency or length of student talk in the two classes.

These results are consistent with research performed by Dillon (1982) and Boersma, Gay, Jones, Morrison, and Remick, (1981) who also found no difference in participation rates between male and female students. Although it may be that gender does not affect classroom participation, there are several other hypotheses that may explain the results of the current study. First, it may be that self-selection plays

a strong role in discouraging students who are not comfortable with the hard-hitting style of the case method classroom from even applying to the business school. Most female students would be well aware that only 25 percent of the entrants to the Business school are women. Perhaps only students who felt confident in this traditionally male environment would even apply for admission to the school.

Second, the nature of the cases was not a variable that was examined in this study. Williams (1990) suggests that the inclusion of female-oriented or male-oriented material in the classroom may have an effect on participation. In the present research, females may have felt more comfortable when the case dealt with female-oriented material such as the marketing of L'Eggs pantyhose, and therefore were more likely to participate. It is likely that many factors may influence participation in the case classroom, not just teacher questions.

A third possible reason for why no gender differences were found is that this study examined only classes taught by male teachers. Brooks (1982) found that gender differences in frequency and duration of speech occurred only in classes taught by female professors. In classes taught by male professors, no significant differences were found for either of these variables. Brooks suggests that male students in the class may have their dominance behaviour suppressed by the presence of a male professor. Alternatively, it may be that differences in teaching style between male and female professors leads to the emergence of different classroom environments. She found that there was far more discussion occurring in the classes led by female professors, whereas male professors tended to prefer the lecture method.

It was interesting to observe that male and female participants did not differ on any of the social-cognitive measures utilized in the present study. In the past, researchers such as Sadker and Sadker (1986) had suggested that there are in fact major differences between men and women on variables such as self-esteem. This lack of difference between men and women in the present study may be one more reason why no gender differences in participation rates were found.

Examination of course grades of male and female students revealed that only for participation grades in Finance was there a significant difference, with men receiving significantly higher grades. This difference between male and female participation grades in Finance is difficult to reconcile with the results of other analyses, such as the lack of difference between men and women in classroom participation variables such as cognitive level of responses and presence of problem-solving components in classroom talk. This suggests that perhaps the participation of women students in Finance classes was being evaluated on the basis of some criterion other than that used for men.

Evaluation of Problem-solving Processes in the Case Method Classroom

The second major goal of the present study was to examine the problem-solving process in the case method classroom in more detail. Little previous research has explicitly focused on discussion in the case method classroom. Although it is hypothesized that students learn problem-solving through case discussion, no one has examined this hypothesis in detail by way of classroom dialogue. Therefore, the effects of time and subject matter on cognitive level of utterances and use of problem-solving components were assessed. Finally, as student

utterances are almost always in direct response to teacher questions in the case method classroom, the relationship between teacher questions and student responses was the last area to be explored.

Effects of time of testing and subject matter on problem-solving skills. It was postulated that as time progressed throughout the academic year, students would be more likely to use higher level problem-solving skills such as strategies and evaluation in class discussion. Also, it was expected that more abstract reasoning skills would be demonstrated in Finance than in Marketing. Consistent with the first hypothesis, there was a significant time effect whereby the number of problem issue components utilized by participants increased between December and March. Consistent with the second hypothesis, there was a significant subject effect with more low level problem-solving skills being used in Marketing than in Finance. Subjects in Marketing were more likely to use problem statement and problem issue than were Finance students. Thus it would appear that more emphasis was placed on the development of concrete conceptual skills in Marketing than in Finance.

These results suggest that MBA students progress through the academic year from being able to summarize the case simply (problem statement) to having a more sophisticated understanding of the issues of the case (problem issue). The students do not, however, appreciably increase in their use of strategies or evaluation. Interestingly, employers often criticize graduates of MBA programs for lack of implementation skills (Gorb, 1987). Alternatively, it may be unreasonable to assume that students will learn all of the problem-solving skills in an eight-month period. In fact, Western's promotional

literature suggests that most of the emphasis in these early courses will be on teaching the students how to determine the issues of the case. The results of this study would suggest that the program is very proficient at teaching this specific skill.

Research has found that one important factor that differentiates good and poor problem-solvers is ability to understand the problem (Silver & Marshall, 1990). Therefore, it may be important that in first year of the MBA program, most of the emphasis is put on understanding the problem in case analysis. Cases are usually ill-defined problems, and therefore a clear understanding of the case is necessary for problem solution.

Effect of time of testing and subject matter on cognitive level of responses. It was hypothesized that as the year progressed, students would make more high than low level utterances. Furthermore, it was expected that more high level utterances would occur in Finance than in Marketing. The results only partially supported these hypotheses. No significant effect for time of year by cognitive level interaction was found for either of the dependent variables (duration or frequency of responses). However, there was a significant two-way course by cognitive level interaction, with more frequent low level responses occurring in Marketing than in Finance. This finding seems to suggest that there was greater emphasis on lower level cognitive thinking in the Marketing classes. This result supports Good, Sikes, and Brophy's (1973) conclusion that low level thinking is more likely to occur in courses whose content is "soft" knowledge or knowledge about relationships than in courses involving "hard" knowledge and symbolic reasoning.

Congruence of cognitive level in teacher-student interactions. The final set of hypotheses dealt with the relationship between teacher questions and student responses. It was hypothesized that there would be congruence between the cognitive level of teacher questions and the cognitive level of students' responses. Consistent with this view, it was found that students were more likely to match than not match the cognitive level of the teacher's questions. This finding is important because as several researchers (e.g., Dillon, 1982) have suggested, matching does not frequently occur in the classroom. However, Dantonio and Paradise (1988) also found good agreement between teacher questions and student responses.

One variable that does not appear to have been considered in previous research on teacher-student matching is characteristics of students, such as age. Good cognitive congruence between teacher questions and student responses was found by Foster (1980) in a study of third-year medical students who were substantially older and better educated than Dillon's (1982) high school students. It may be that as students mature they get more skilled in matching their responses to teacher questions.

Another factor related to why some studies find better teacher-student congruence than others is the degree to which teachers are trained to respond to verbal interactions in class. Dantonio and Paradise (1988) found that teachers can be trained in question/answer correspondence and that this training would increase their ability to refocus incongruent responses made by students. Case method teachers do not explicitly evaluate the cognitive level of students' responses but are consciously trying to teach their students how to be expert problem-

solvers. They work through the case with a mental plan and therefore must listen carefully to facilitate the discussion.

Overall, it was found that more low than high level cognitive questions were asked by teachers. This situation appears to be a problem for teachers at all levels of education. In the Foster (1980) study, no higher level talk occurred at all in about half of the classes that were taped. As Foster suggests, this low level of cognitive thinking appears to be primarily related to the types of questions asked by teachers, with 67 percent of teacher questions at the lowest cognitive level of Bloom's taxonomy (knowledge). This finding is very similar to the present study where about 83 percent of questions in Marketing and about 75 percent of the questions in Finance were low level.

A significant interaction was found between course and cognitive level of teacher questions, with more low level questions occurring in Marketing than in Finance. It may be that the content of Marketing is more likely to lead to students being asked low level questions. In Finance, student ability to perform numerical analyses was often a key to formulating a plan for a particular case. Numerical analysis, a higher problem-solving skill, was seldom part of Marketing classes. However, there is a confound here between teacher effects and subject matter effects.

Finally, an interesting three-way interaction occurred between course, cognitive level of teacher question, and congruence of questions and answers. More low level cognitive questions were asked in Marketing than in Finance. Furthermore, it was found that students were more

likely to correctly match high level questions in Finance than in Marketing. One possible reason that students were less likely to match high level questions in Marketing, may be that the predominance of low level questions these students were asked made them ill-prepared to answer high level questions. In other words, lack of practice with these types of questions impacted strongly on their ability to demonstrate high cognitive level skills in Marketing class discussions.

Another reason for poor cognitive congruence may be the short wait time that occurred after questions were asked. As indicated in the introduction, preliminary observation of case method classrooms before this study was performed indicated that even before teachers finished asking questions many students often had their hand in the air and the questions were always answered quickly. Goodwin, Sharp, Cloutier, Diamond, and Dalgaard (1983) suggest that high cognitive level questions often require at least five seconds of wait time for students to formulate a correct response. In the case method classes investigated in this study students seldom had that much time to consider carefully their answers to questions.

Limitations of the Study

As this is a correlational rather than an experimental study, cause-effect relationships can not be made. However, it is only by performing studies such as this that clear information can be derived about what variables need to be investigated more experimentally in the future. The results of the present study suggest that students may need to be given more explicit training on problem-solving and critical thinking in the case method. In order to properly examine this issue, an experimental

study would have to be performed. Because this study was naturalistic the results would appear to be generalizable to other case classrooms but cause-effect interpretations are problematic.

A second limitation is the confound between teacher and subject matter effects. It is not clear whether differences found between Marketing and Finance courses are due to subject matter or due to the fact that the courses were taught by different teachers. This study needs to be replicated with several different Marketing and Finance teachers before the differences noted between the two classrooms could be clearly attributed to the course content rather than the individual teachers. Unfortunately, such a study was beyond the scope of the present research. However, it should be noted that most of the results concerning subject matter differences between Marketing and Finance were in the predicted direction.

Another limitation of this study is that only one class of MBA students was observed. It is fortunate that over 90 percent of the students agreed to complete the personality measures for the two courses. However, it would be preferable to replicate this study with other students to eliminate the possibility that the results of the study are spurious in any way. It may be that the widely held reputation of Western's Business school as the "Harvard of the North" leads to only a narrow range of student types gaining admission to the MBA program. Replication of the study in several settings would determine conclusively whether the results have good external validity. The small sample size of this study also resulted in limited statistical power, perhaps decreasing the chances that significant effects would be found.

This may have particular significance for the hypotheses involving gender. The sample size for women was only 15, which may not have been large enough sample size to detect differences between men and women.

Implications of the Study

There are several implications of the present research. To begin with, the results suggest that participation in case method classrooms is related to student academic achievement. This finding is very important in light of Foster's (1980) study showing little or no relationship between medical student participation in small group discussions and final practice exams. It may be that only when discussion is a primary mode of instruction will participation have a direct relationship to grades. A relationship between student participation and amount learned is important for the students participating in this study because 95% of their teachers use the case method of teaching exclusively. Moreover, the results of this study suggest that case method instruction is a helpful vehicle for learning in the business classroom.

As Nicastro (1991) has suggested, one of the primary benefits of the case method of teaching is its focus on active rather than passive learning. Active learning involves the student working with the material in some way, beyond passively listening and taking notes as in a lecture (Bonwell & Eison, 1991). The case method is an active learning technique where students must problem solve and engage in critical thinking, both in classroom discussion and in preparation for class. Bonwell and Eison suggest that active learning is more likely to lead to the development of critical thinking skills than is the traditional lecture method.

Andrews (1980) stated that one of the primary concerns of college instructors is improving discussion in the classroom. Therefore, the case method with its focus on active participation may be an important method that many teachers may wish to consider adopting.

Consistent with this conclusion, Costin (1972) reviewed 20 studies of lecture versus discussion methods of teaching and found that the discussion method was superior to the lecture method for the development of higher level thinking and for problem-solving in students. When it came to learning factual knowledge no difference was found between the two methods. As the primary purpose of management education is to learn not a store of facts, but rather a method of analyzing cases or situations, a discussion method of learning seems clearly suited to this discipline. Other college classrooms which place a primary emphasis on problem-solving might benefit from the inclusion of this method in the curriculum.

The present study showed that with academic background variables statistically controlled, final course and participation grades were significantly related to frequency and length of speaking in the classroom. From the perspective of cognitive psychology, this suggests that if class participation engages the learner in active processing of the material being discussed, the elaboration and embedding of information in memory is facilitated (Glover & Bruning, 1987). Furthermore, engaging in active learning requires the learner to monitor the learning process (Bonwell & Eison, 1991), or in other words, to take a metacognitive approach to learning (Glover & Bruning, 1987). It has been found that students who engage in metacognition while learning are

more likely to generalize the results of learning to other situations (Glover & Bruning, 1987; Biehler & Snowman, 1982). As both generalization and transfer of practice are important goals of management education, the case method seems well suited to meeting these goals.

Metacognition also plays an important role in the problem-solving process, because to solve a problem successfully requires the learner to engage in self-monitoring, and to review and select strategies for implementation (Sternberg, 1981). It seems likely that successful case method students must have excellent metacognitive skills and that these skills will also improve as a result of their experiences in the classroom.

Other cognitive theories provide alternative interpretations of why participation in case method classes tends to facilitate learning. For instance, Jacoby's (1978) encoding variability hypothesis predicts that recall of information will be enhanced if the information is encoded in several different ways (e.g., through both written work and oral discussion). Jacoby theorizes that increasing the number of ways information is encoded enhances access routes for recall of that information Jacoby found with his own research that subjects were far more likely to recall answers to problems if they had actively worked to find the solution during study, then if the answers had been given them. Again, this substantiates the claims of case teachers who believe it is the process that is the key to learning, not simply knowing the solution.

Two other cognitive hypotheses provide reasons for the impact of the

case method on student learning. Both of these were developed from the levels of processing theory of Craik and Lockhart (1972). One is the distinctiveness of encoding hypothesis which suggests that the material which is distinctive is more likely to be remembered (Glover, Ronning & Bruning, 1990). One way that distinctiveness is manipulated in research studies is by increasing the level of difficulty of decisions that subjects must perform while engaged in a learning task. More difficult decisions are seen as being more distinctive.

Glover and his associates (Glover, Bruning, & Plake, 1982; Glover, Plake, & Zimmer, 1982) have performed a series of experiments to investigate this theory. In one study they asked subjects to make decisions while reading (Glover, Plake, and Zimmer, 1982). The difficulty level of the decision was based on Bloom et al.'s (1956) taxonomy of educational objectives. As postulated they found that recall was dependent on the type of decision making required, with more material being recalled for higher level decisions (e.g., synthesis or evaluation) than for low level decisions (e.g., fact or knowledge). This study has strong implications for the results of the present research. It would suggest that one of the reasons that the case method is effective, perhaps even more so than traditional discussion methods, is that it focuses on decision making and problem-solving processes which increases the distinctiveness of material being presented.

The second hypothesis evolving from Craik and Lockhart's (1972) levels of processing theory is the elaboration of processing perspective. This hypothesis suggests that the degree of elaboration of material during learning may have a strong influence on later recall

(Glover, Ronning, & Bruning, 1990). In other words, elaboration during learning enriches the memory set, and therefore, increases the likelihood of recall at a later time. Elaboration of memory involves enhancing the memory with details. An important feature of the case method is the constant elaboration that occurs during class discussion, both by the teacher and the students. In addition, students are presented with literally hundreds of cases over the first year on which to hone their problem-solving skills. It has been suggested that by presenting several examples of a problem, students are more likely to remember the solution than if one example is merely repeated (Glover, Ronning, & Bruning, 1990). Again, this allows more elaboration of the mental representation of the problem type to occur. Therefore, this research would suggest that elaborateness of the encoded information may be another important reason why the case method is an effective learning technique.

All three of these hypotheses (encoding variability, distinctiveness of encoding and elaboration of processing) stress the importance of what the student does with the information while encoding occurs. The case method appears to provide a venue for very rich encoding to occur. This may be one of the major strengths of this learning method.

A second implication of the present study is that the cognitive level of teacher questions determines the cognitive level of student responses. Therefore, teachers clearly have the ability to facilitate student learning through their careful attention to the type of questions they ask. Dantonio and Paradise (1988) found that student teachers could be trained to ask specific types of questions. Clearly

more teachers need to have such explicit training.

In addition, it was found that higher level student responses were significantly related to final Finance participation grades. The direct relationship of this process variable to outcome variables was thus more firmly elucidated. It may be necessary to train teachers specifically to increase their wait time after high level questions are asked and to train students to overtly consider the cognitive method they are using to form their responses. Goodwin et al. (1983) suggested that such explicit training may be necessary to improve the cognitive level of questions asked in university classrooms.

Of the social-cognitive variables examined in this study, the only one that emerged as a significant predictor of outcome variables was critical thinking skills. It may be that critical thinking is more important than self-esteem, assertiveness, and a lack of communication anxiety for academic success with the case method. The present results suggest that teachers must consider how they can facilitate the development of critical thinking skills. More frequent utilization of high cognitive level questions and high level responses would seem to be one way of promoting critical thinking.

In addition, teachers clearly need to focus more on encouraging students to use higher level problem-solving components, such as evaluation and reasoning, in class discussion. There was no significant increase in these problem-solving components throughout the year, yet clearly these components require the learner to engage in the more difficult and cognitively complex aspects of critical thinking. Perhaps with novice problem-solvers there is a tendency for teachers to focus on

the beginning steps of problem-solving, such as getting students to summarize the case, and making sure the students have a clear understanding of the issues in a business case. Yet in the real world they must be able to evaluate strategies and implement plans as well.

Consistent with previous research, the results of this study suggest that case method teachers have a difficult time accomplishing the transition to higher-order problem-solving skills (Carroll, Paine, & Ivancevich, 1972; Smith, 1987). For this reason, business educators have often suggested that the case method of teaching should be combined with other management education techniques such as role-playing and gaming simulations (Hopkins & Kaman, 1987; Thorton & Cleveland, 1990). These methods might be more capable of teaching students problem-solving implementation skills. Alternatively, it may be necessary to develop methods of incorporating higher level problem-solving skills into case discussions. Case teachers typically utilize books such as Erskine, Leenders, Mauffette-Leenders's (1981) Teaching with Cases, which outline explicitly how to prepare and teach a case class. It may be necessary to develop curricula where the types of questions needed to explicitly increase critical thinking skills are included with each case.

The finding that critical thinking was the only social-cognitive measure related to grades implies that teachers may have a strong impact on learners, even with the variation in personality characteristics that students possess. In other words, had it been determined that the primary factor determining grades was the traits the learner brings to the classroom, this would suggest there is little the teacher can do to promote learning. Instead, the results of the present study suggest that

it is variables under teacher control, such as type of question asked and length of time student spoke that had the greatest impact on grades.

Furthermore, the results of this study indicate that subject matter was a stronger predictor of classroom interaction than was student gender. This was also found in the study of Good, Sikes, and Brophy (1973). This suggests that subject matter is an important variable to explore in future research. Although in the present study it is difficult to unravel the confound between subject matter and teacher effects, there is an indication that in more "soft" knowledge classes like Marketing, the predominant type of cognitive question asked was low level. Teachers of such classes need to evaluate the educational objectives of their courses to see if they are achieving them. It may be that they want to increase the number of high cognitive level questions being asked or it may be that the current 1:3 mix of higher to lower level questions is sufficient to meet these goals.

Finally, the finding that Graduate Management Admissions Test score was unrelated to grades in two primary courses in the MBA program calls into question the use of this test as a screening device for entrance to the MBA. It may be simply that the group that gained admission to the MBA program was highly selected and this is why no correlation was seen between GMAT and academic achievement. However, there did appear to be quite a bit of variability in GMAT scores for this sample as scores ranged from 420 to 710. It appears that other subject characteristics such as degree type or undergraduate average may be better predictors of success in this area.

Suggestions for Future Research

Although there was no support for hypothesized gender differences in case classroom interactions, this hypothesis needs further investigation. Williams (1990) suggested that other teacher variables such as differential smiling, eye contact and nonverbal activities may contribute to gender differences and the classroom climate. Also, as was suggested earlier, the specific content of business cases may at times either include or exclude women or men from the discussion. If, at this more subtle level, women are not included in the classroom discourse, their sense of academic self-esteem and their long-term career goals within a profession may be affected. It would be interesting to re-examine academic self-esteem at various intervals throughout the MBA program to see if gender effects are apparent, and to determine if gender effects influenced student choices. Brooks (1982) suggested that it would be important to examine classes taught by both male and female professors in the future. It would interesting to see if gender differences emerge in classes taught by female professors. Clearly, more research needs to be done to investigate why it is that some researchers find gender differences in classroom interaction, while others do not.

Another unexpected result of this study was the very small impact of social-cognitive variables such as self-esteem, assertiveness and communication anxiety on grades and length and frequency of speaking in the classroom. Although none of these variables were significantly predictive of outcome measures, this result does not necessarily mean that these characteristics are unimportant to success in the case classroom. Most of the research on student characteristics in relation

to grades has been performed at the high school and first year of university level (e.g., Williams, 1971; Comadena & Prusank, 1988), whereas nearly all of the participants in the present study had already completed a university degree, worked an average for three years, and were likely to be in their mid-twenties. By the time students reach the age of 26, it is perhaps not surprising that they will choose an academic program that matches their personality profile. This self-selection of subjects into the MBA program is one reason why only highly assertive students with low communication anxiety are likely to apply. Social-cognitive characteristics may emerge as important predictors of choice of post graduate degree programs, rather than being a predictor of success within a program. MBA programs which offer more diversity in teaching styles, such as York University, may have students with more diversity in terms of their social-cognitive characteristics. Conversely, other programs which rely more heaviiy on the lecture method may attract students with quite different characteristics than those at Western. This topic would be an interesting area to pursue in future research.

It was surprising to discover how seldom teachers asked higher cognitive level questions even at the graduate level of education. Future research should investigate whether this lack of higher level questions is common at other professional schools. Also, because it has been found that teachers can increase their frequency of use of higher level questions and can focus students on their incongruent responses (Dantonio & Paradise, 1982), it would seem important to try to increase the number of high level questions and responses with case method

students.

There has been much debate in the literature about the appropriate mix of high and low cognitive level teacher questions in the classroom. Clark, Gage, Marx, Peterson, Staybrook and Winne (1979) suggest a mix of 15% higher cognitive level questions and 85% low level questions, whereas Tobin and Capie (1982) suggest a ratio of two to one in favour of higher level questions. As Tobin and Capie (1982) suggest the best mix probably depends upon the cognitive complexity of the material being learned and individual differences in learners. This is clearly an important variable for future research. Although it seems logical to want to increase the number of higher level questions asked of students in the case method classroom, it would be necessary to experiment on what the optimal mix of lower and higher level questions should be. If asking too many higher level questions decreases student engagement in class, then this is clearly detrimental to learning.

Future research is necessary to determine why the case method may be a better vehicle for transmission of learning than other discussion formats. The distinctiveness of encoding hypothesis appears to be one mechanism that could be experimentally tested. It would be interesting to see, in a controlled study, if the oral presentation of material in case discussion interspersed with cognitively cued questions, led to the type of recall seen in studies where the presentation of materials was totally written (e.g. Glover, Plake & Zimmer, 1982). Quite clearly if it could be shown that increasing the cognitive level difficulty of teacher questions directly enhances student recall, this would provide powerful evidence for the distinctiveness of encoding hypothesis and for the use

of the case method in the management education and other fields. It might also provide a stronger incentive for teachers to increase their use of higher level questions.

To test the external validity of this study, it would be necessary to replicate the study in several other case method classrooms. Specifically, it would be interesting to replicate the study in law classes to see if the same relationships exist between classroom participation and course grades. In law school classes, grades are typically based on exams and sometimes essays. It is seldom that students receive an actual grade for participation. It may be that in this environment students are not as motivated to participate or to develop verbal problem-solving skills.

Student classroom participation should be examined over the full two years of the MBA program. The present research suggests that by the end of the first year, the major improvement in problem-solving has been in student ability to identify problem issues in cases. It is important to determine if an increase of the higher level problem-solving skills, such as strategies or evaluation occurs in the second year of the MBA program.

Another issue that needs attention is whether there is an increase in student critical thinking skills during the MBA training, as measured by tests such as the Watson Glaser Critical Thinking Appraisal. Research by Foster (1980) and Smith (1977) found an increase in critical thinking skills of university students over the course of a term. It would be expected that as students improve in problem-solving skills, they will increase in their critical thinking skills, which seems an important

consequence of university education.

Conclusions

The present results provide a promising beginning for future research on classroom interaction in the business management classroom. Previous research has seldom been so labour intensive and has never examined every single utterance in business classes at different points in the academic year. This provided a unique opportunity to receive a bird's eye view of classroom learning and to carefully examine the development of problem-solving. One major contribution of this study was the discovery that the only social-cognitive characteristic to be related to academic achievement was critical thinking. This suggests that more research needs to be performed on helping students develop their critical thinking skills. The relationship between critical thinking and problem-solving in the case method classroom seems obvious, yet no one has explicitly examined this relationship before. The results of the present research suggest that some students were better able to apply their critical thinking skills to case analyses than others. This critical analysis of the content of case method classes is unique in the business education literature.

In addition to critical thinking skills the results also point to a need to help teachers increase the number of higher level cognitive questions asked. Students in the present study were very good at matching the cognitive level of the questions they were asked, so it may be that if they were asked more higher level cognitive questions, a stronger relationship between higher level questions and grades might have been found.

The present study also suggests that the cognitive level of classroom interaction depends upon the type of question asked by teachers. Teachers, as facilitators of the case analysis in class, can obviously have a strong effect on student learning. It was definitely surprising that, even at the graduate level, 80 percent of the questions being asked by teachers were at a low cognitive level. Higher critical thinking skills were, therefore, required only in 20 percent of the questions asked. Although such a mix of high and low level questions had been found in other university classrooms (Foster, 1980), no one had ever specifically examined the business classroom for this variable before.

Previous research has often relied on experts to comment on whether or not students were learning problem-solving skills (eg., Carroll, Paine, & Ivancevich, 1972). This is the first study to investigate actual classroom dialogue in case method classes, and to relate explicitly that dialogue to measures of academic achievement. The present findings suggest that students improve in their problem-solving skills as the year progresses. Furthermore, it was found that classroom participation was directly related to student achievement. Together these results suggest that the case method is a powerful learning tool in the classroom, particularly for learning to solve the type of ill-defined problems seen in business.

Student engagement is an important factor in determining whether or not students will learn, and in the case classroom it is practically impossible for students not to become highly engaged in discussion. This focus on active learning in the case classroom (Nicastro, 1991) should

perhaps be emulated in many other classrooms. The focus in case method classrooms is on how to analyze problems, with more emphasis being placed on problem-solving processes rather than on determining the right answers to specific problems. The case method, therefore has the potential of teaching students to become life-long learners, which is one of the primary goals of postsecondary education.

NOTE

1. As indicated in the method, participation grades accounted for part of the final composite course grades. To determine if the pattern of results for final course grades would be the same if the effect of participation grade was statistically controlled, two separate hierarchical multiple regression analyses were performed. In these analyses participation grades were entered on the first step, and the student characteristic variables were entered on the second step. The student characteristic variables were degree type, undergraduate academic average, GMAT score, WGCTA score, SEI score, assertiveness response probability scale score and communication anxiety score. The outcome measures were final grades in the courses.

For both Marketing and Finance the multiple R's were significant. This result is similar to previous analyses which had solely student characteristics as the predictors. For the final course grade in Marketing, there was a significant effect due to all predictor variables collectively, R= .78. This finding indicates that 61% of the outcome variance can be accounted for by these variables. In particular, participation grade and having a Social Science degree accounted for a significant percentage of the final Marketing grades. This result is similar to what was found in previous analyses.

However, unlike previous analyses WGCTA did not emerge as a significant predictor of Marketing course grades. It will be recalled from Table 5 that WGCTA was a significant predictor of final Marketing participation grades, i.e. the two variables share some variance. It may be that once the variance that was attributable to the Marketing

participation grade was removed on step 1 of this analysis, on step 2 there was not enough unique variance attributable to WGCTA for this variable to emerge as significant.

For the final course grade in Finance, there was a significant overall regression effect due to the predictor variables in combination, R= .79. This result suggests that 61% of the outcome variance can be accounted for by the predictor variables. In this analysis both Finance participation grade and GMAT emerged as significant predictors of final grades. Unlike previous analyses having an Engineering degree did not emerge as a significant predictor, although the beta value associated with having an Engineering degree approached significance (p.=.08).

In this analysis GMAT also was a significant predictor of grades. As this was the only analysis where this occurred this result may be spurious. Similar to the other analyses neither SEI score, nor Communication anxiety score, nor Assertiveness Response probability scale score emerged as a significant predictors in these analyses. Therefore, these findings suggest that the pattern of results in these analyses, where participation grade was statistically controlled, was substantially similar to that reported in the text of the results section.

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Appendix A

Watson-Glaser Critical Thinking Appraisal

Watson-Glaser Critical Thinking Appraisal (Form A)

Directions

This booklet contains five types of tests designed to find out how well you are able to reason analytically and logically. *Please read the following instructions prior to beginning the test.*

1) Please use a pencil to mark your answers on the accompanying answer sheet. If you wish to change your answer, be sure to erase your old answer completely.

2) Now *turn the answer sheet sideways* so that you can fill in the necessary information. Print your name, the date, the name of the school, the city and the province.

3) Now look at the **Name Block** in the right corner. Please print one letter of your name in each box, starting with the first box on the left. Remember to print your last name first, then go to the section titled First Name, and then print your middle initial in the space titled MI. If either your last name or first name is too long to fit in the boxes provided print as many letters as will fit.

4) In the column below each letter of your name, make a heavy black mark in the space with the same letter. Your mark should fill the space completely, but should not extend beyond the space. Do this for all the letters of your name.

5) Below the Name Block, mark: a) the **form** of the test (Form A), and b) your **Sex**. Leave the Grade column blank.

6) Under **Year of Birth** mark the last two digits of your year of birth. Finally please fill in your student number where it says I.D. Number.

(OVER)

7) Now turn you answer sheet so the you can read the words **Watson-Glaser Critical Thinking Appraisal**. In this test all of the questions are in the test booklet. There are five separate tests in the booklet, and each one is preceded by its own directions. For each question, decide which answer you think is best. Do not discuss you answers with anyone else. Since your score will be the number of items you answer correctly, try to answer each question even if you are not sure that your answer is correct.

8) Record your answer by making a black mark in the appropriate space on the answer sheet. Always be sure that the answer space has the same number as the question in the booklet. If you change you mind about an answer, be sure to erase the first mark completely.

9) Do not spend too much time on any one question. When you finish a page, go right on to the next one. You may go back at the end of the test to check you answers.

10) When you are ready to begin turn the page.

(OVER)

DIRECTIONS

An inference is a conclusion a person can draw from certain observed or supposed facts. For example, if the lights are on in a house and music can be heard coming from the house a person might infer that someone is at home. But this inference may or may not be correct. Possibly the people in the house did not turn the lights and the radio off when they left the house.

In this test, each exercise begins with a statement of facts that you are to regard as true. After each statement of facts you will find several possible inferences—that is, conclusions that some persons might draw from the stated facts. Examine each inference separately, and make a decision as to its *degree* of truth or falsity.

For each inference you will find spaces on the answer sheet labeled T, PT, ID, PF, and F. For each inference make a mark on the answer sheet under the appropriate heading as follows:

EXAMPLE

Two hundred students in their early teens voluntarily attended a recent weekend student conference in a Midwestern city. At this conference, the topics of race relations and means of achieving lasting world peace were discussed, since these were the problems the students selected as being most vital in today's world.

1. As a group, the students who attended this conference showed a keener interest in broad social problems than do most other students in their early teens.
2. The majority of the students had not previously discussed the conference topics in their schools.
3. The students came from all sections of the country.
4. The students discussed mainly labor relations problems.
5. Some teenage students felt it worthwhile to discuss problems of race relations and ways of achieving world peace.

Test 1

	T	PT	ID	PF	F
1		■			
2				■	
3			■		
4					■
5	■				

T if you think the inference is definitely **TRUE**; that it properly follows beyond a reasonable doubt from the statement of facts given.

PT if, in the light of the facts given, you think the inference is **PROBABLY TRUE**; that it is more likely to be true than false.

ID if you decide that there are **INSUFFICIENT DATA**; that you cannot tell from the facts given whether the inference is likely to be true or false; if the facts provide no basis for judging one way or the other.

PF if, in the light of the facts given, you think the inference is **PROBABLY FALSE**; that it is more likely to be false than true.

F if you think the inference is definitely **FALSE**; that it is wrong, either because it misinterprets the facts given, or because it contradicts the facts or necessary inferences from those facts.

Sometimes, in deciding whether an inference is probably true or probably false, you will have to use certain commonly accepted knowledge or information that practically every person has. This will be illustrated in the example that follows.

Look at the example in the next column; the correct answers are indicated in the block at the right.

In the above example, inference 1 is probably true (PT) because (as is common knowledge) most people in their early teens do not show so much serious concern with broad social problems. It cannot be considered definitely true from the facts given because these facts do not tell *how much* concern other young teenagers may have. It is also possible that some of the students volunteered to attend mainly because they wanted a weekend outing.

Inference 2 is probably false (PF) because the students' growing awareness of these topics probably stemmed at least in part from discussions with teachers and classmates.

There is no evidence for inference 3. Thus there are insufficient data (ID) for making a judgment on the matter.

Inference 4 is definitely false (F) because it is given in the statement of facts that the topics of race relations and means of achieving world peace were the problems chosen for discussion.

Inference 5 necessarily follows from the given facts; it therefore is true (T).

In the exercises that follow, more than one of the inferences from a given statement of facts may be true (T), or false (F), or probably true (PT), or probably false (PF), or have insufficient data (ID) to warrant any conclusion. Thus you are to judge each inference independently.

Make a heavy black mark in the space under the heading that you think best describes each inference. If you change an answer, erase it thoroughly. Make no extra marks on the answer sheet.

Go on to the next page ▶

EXERCISES

In 1946 the United States Armed Forces conducted an experiment called "Operation Snowdrop" to find out what kinds of military men seemed to function best under severe arctic climatic conditions. Some of the factors examined were weight, age, blood pressure, and national origin. All of the participants in "Operation Snowdrop" were given a training course in how to survive and function in extreme cold. At the conclusion of the experiment it was found that only two factors among those studied distinguished between men whose performance was rated as "effective" and those rated as "not effective" on the arctic exercises. These factors were: (1) desire to participate in the experiment, and (2) degree of knowledge and skill regarding how to live and protect oneself under arctic conditions.

1. Despite the training course given to all of the participants in "Operation Snowdrop," some participants exhibited greater arctic survival knowledge or skill than others.
2. It was believed by the Armed Forces that military operations might someday be carried out in an arctic-like environment.
3. A majority of the men who participated in "Operation Snowdrop" thoroughly disliked the experience.
4. As a group, the men of Scandinavian origin were found to function more effectively under severe arctic conditions than those of Latin origin.
5. Participants having normal weight and blood pressure were rated as significantly more effective on the arctic exercises than were the other participants.

Mr. Brown, who lives in the town of Salem, was brought before the Salem municipal court for the sixth time in the past month on a charge of keeping his pool hall open after 1 a.m. He again admitted his guilt and was fined the maximum, $500, as in each earlier instance.

6. On some nights it was to Mr. Brown's advantage to keep his pool hall open after 1 a.m., even at the risk of paying a $500 fine.
7. Mr. Brown's pool hall was held by the municipal court to be within the legal jurisdiction of the town of Salem.
8. Mr. Brown repeatedly flouted the 1 a.m. closing law in hopes of getting it repealed.
9. The maximum fine of $500 was fully effective in keeping all pool halls in Salem and its vicinity closed after 1 a.m.
10. There was one week during the past month when Mr. Brown observed the legal closing time each night.

Some time ago a crowd gathered in Middletown to hear the new president of the local Chamber of Commerce speak. The president said, "I am not asking, but demanding, that labor unions now accept their full share of responsibility for civic improvement and community welfare. I am not asking, but demanding, that they join the Chamber of Commerce." The members of the Central Labor Unions who were present applauded enthusiastically. Three months later all the labor unions in Middletown were represented in the Chamber of Commerce. These representatives worked with representatives of other groups on committees, spoke their minds, participated actively in the civic improvement projects, and helped the Chamber reach the goals set in connection with those projects.

11. Both the labor union representatives and the other members of the committees came to a better recognition of one another's viewpoints through their Chamber of Commerce contacts.
12. Union participation in the Middletown Chamber of Commerce greatly reduced worker-management disputes in that town.
13. The active participation of the labor unions resolved many controversies at all the committee meetings of the Chamber of Commerce.
14. Most of the union representatives regretted having accepted the invitation to participate in the Chamber of Commerce.
15. Some of the Chamber of Commerce members came to feel that their president had been unwise in asking the union representatives to join the Chamber.
16. The new president indicated in the speech that the town's labor unions had not yet accepted their full responsibility for civic improvement.

Go on to the next page ▶

TEST 2: RECOGNITION OF ASSUMPTIONS

DIRECTIONS

An assumption is something presupposed or taken for granted. When you say, "I'll graduate in June," you take for granted or assume that you will be alive in June, that your school will judge you to be eligible for graduation in June, and similar things.

Below are a number of statements. Each statement is followed by several proposed assumptions. You are to decide for each assumption whether a person, in making the given statement, is really making that assumption—that is, taking it for granted, justifiably or not.

If you think that the given assumption is taken for granted in the statement, make a heavy black mark under "ASSUMPTION MADE" in the proper place on the answer sheet. If you think the assumption is *not* necessarily taken for granted in the statement, blacken the space under "ASSUMPTION NOT MADE." Remember to judge each assumption independently.

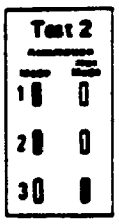
Below is an example. The block at the right shows how these items should be marked on the answer sheet.

EXAMPLE

Statement: "We need to save time in getting there so we'd better go by plane."

Proposed assumptions:

1. Going by plane will take less time than going by some other means of transportation. (It is assumed in the statement that the greater speed of a plane over the speeds of other means of transportation will enable the group to reach its destination in less time.)
2. There is plane service available to us for at least part of the distance to the destination. (This is necessarily assumed in the statement since, in order to save time by plane, it must be possible to go by plane.)
3. Travel by plane is more convenient than travel by train. (This assumption is not made in the statement—the statement has to do with saving time, and says nothing about convenience or about any other specific mode of travel.)



EXERCISES

Statement: "In the long run, the discovery of additional uses for atomic energy will prove a blessing to humanity."

Proposed assumptions:

17. Additional and beneficial ways of using atomic energy will be discovered.
18. The discovery of additional uses for atomic energy will require large, long-term investments of money.
19. The use of atomic energy represents a serious environmental hazard.

Statement: Zenith is the city to move to—it has the lowest taxes."

Proposed assumptions:

20. Lower taxes imply efficient city management.
21. In deciding where to live, it is important to avoid high taxes.
22. The majority of the residents in Zenith are content with their present city government.

Statement: "We have permitted ourselves to be stampeded into a life of unnatural and dangerous high pressure. We pace ourselves by machines instead of by our natural rhythm."

Proposed assumptions:

23. We can resist being pushed into a life of unnatural high pressure.
24. The way of life we have adopted is not in tune with the way human beings were meant to live.
25. The rapid pace of our lives does not help us to achieve our goals.

Statement: "I'm traveling to South America. I want to be sure that I do not get typhoid fever, so I shall go to my physician and get vaccinated against typhoid fever before I begin my trip."

Proposed assumptions:

26. If I don't take the injection, I shall become ill with the fever.
27. By getting vaccinated against typhoid fever, I decrease the chances that I will get the disease.
28. Typhoid fever is more common in South America than it is where I live.
29. My physician can provide me with a vaccination that will protect me from getting typhoid fever while I am in South America.

Statement: "If war is inevitable, we'd better launch a preventive war now while we have the advantage."

Proposed assumptions:

30. War is inevitable.
31. If we fight now, we are more likely to win than we would be if forced to fight later.
32. If we don't launch a preventive war now, we'll lose any war that may be started by an enemy later.

Go on to the next page ▶

TEST 3: DEDUCTION

DIRECTIONS

In this test, each exercise consists of several statements (premises) followed by several suggested conclusions. *For the purposes of this test, consider the statements in each exercise as true without exception.* Read the first conclusion beneath the statements. If you think it *necessarily* follows from the statements given, make a heavy black mark under "CONCLUSION FOLLOWS" in the proper place on the answer sheet. If you think it is *not a necessary conclusion* from the statements given, put a heavy black mark under "CONCLUSION DOES NOT FOLLOW," even though you may believe it to be true from your general knowledge.

Likewise, read and judge each of the other conclusions. Try not to let your prejudices influence your judgment—just stick to the given statements (premises) and judge each conclusion as to whether it *necessarily* follows from them.

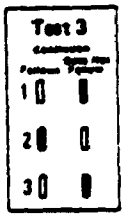
The word "some" in any of these statements means an indefinite part or quantity of a class of things. "Some" means *at least* a portion, and *perhaps* all of the class. Thus, "Some holidays are rainy" means *at least* one, possibly more than one, and *perhaps* even all holidays are rainy.

Study the example carefully before starting the test.

EXAMPLE

Some holidays are rainy. All rainy days are boring. Therefore—

1. No clear days are boring. (The conclusion does not follow. You cannot tell from the statements whether or not clear days are boring. Some may be.)
2. Some holidays are boring. (The conclusion necessarily follows from the statements since, according to them, the rainy holidays must be boring.)
3. Some holidays are not boring. (The conclusion does not follow, even though you may know that some holidays are very pleasant.)



EXERCISES

No person who thinks scientifically places any faith in the predictions of astrologers. Nevertheless, there are many people who rely on horoscopes provided by astrologers. Therefore—

33. People who lack confidence in horoscopes think scientifically.
34. Many people do not think scientifically.
35. Some scientific thinkers trust some astrologers.

All members of symphony orchestras enjoy playing classical music. All members of symphony orchestras spend long hours practicing. Therefore—

36. Musicians who play classical music do not mind spending long hours practicing.
37. Some musicians who spend long hours practicing enjoy playing classical music.

Rice and celery must have a good deal of moisture in order to grow well, but rye and cotton grow best where it is relatively dry. Rice and cotton grow where it is hot, and celery and rye where it is cool. In Timbuktu, it is very hot and damp. Therefore—

38. Neither the temperature nor the moisture conditions in Timbuktu are favorable for growing a celery crop.
39. The temperature and moisture conditions in Timbuktu are more favorable for growing rice than for growing celery, cotton, or rye.
40. Conditions in Timbuktu are not altogether favorable for growing a cotton or a rye crop.

Most persons who attempt to break their smoking habit find that it is something that they can accomplish only with difficulty, or cannot accomplish at all. Nevertheless, there is a growing number of individuals whose strong desire to stop smoking has enabled them to break the habit permanently. Therefore—

41. Only smokers who strongly desire to stop smoking will succeed in doing so.
42. A strong desire to stop smoking helps some people to permanently break the habit.

In one town there are 52 classes in the five elementary schools. Each class contains from 10 to 40 pupils. Therefore—

43. There are at least two classes in the town with exactly the same number of pupils.
44. Most elementary school classes in the town contain more than 15 pupils.
45. There are at least 550 pupils in these elementary schools.

Some Russians would like to control the world. All Russians seek a better life for themselves. Therefore—

46. Some people who would like to control the world seek a better life for themselves.
47. Some people who seek a better life for themselves would like to control the world.
48. If the Russians controlled the world, they would be assured of a better life.

Go on to the next page ▶

TEST 4: INTERPRETATION

DIRECTIONS

Each exercise below consists of a short paragraph followed by several suggested conclusions.

For the purpose of this test, assume that everything in the short paragraph is true. The problem is to judge whether or not each of the proposed conclusions logically follows beyond a reasonable doubt *from the information given in the paragraph.*

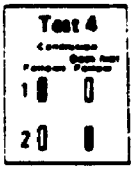
If you think that the proposed conclusion follows beyond a reasonable doubt (even though it may not follow absolutely and necessarily), then make a heavy black mark under "CONCLUSION FOLLOWS" in the proper place on the answer sheet. If you think that the conclusion does *not* follow beyond a reasonable doubt from the facts given, then blacken the space under "CONCLUSION DOES NOT FOLLOW." Remember to judge each conclusion independently.

Look at the example below; the block at the right shows how the answers should be marked on the answer sheet.

EXAMPLE

A study of vocabulary growth in children from eight months to six years old shows that the size of spoken vocabulary increases from zero words at age eight months to 2562 words at age six years.

1. None of the children in this study had learned to talk by the age of six months. (The conclusion follows beyond a reasonable doubt since, according to the statement, the size of the spoken vocabulary at eight months was zero words.)
2. Vocabulary growth is slowest during the period when children are learning to walk. (The conclusion does not follow since there is no information given that relates growth of vocabulary to walking.)



EXERCISES

The history of the last 2000 years shows that wars have steadily become more frequent and more destructive. The twentieth century has the worst record thus far on both these counts.

49. Mankind has not advanced much in the ability to keep peace.
50. If past trends continue, we can expect that there will be more wars in the twenty-first century than there were in the twentieth century.
51. Wars have become more frequent and more destructive because the world's natural resources have become more valuable.

When the United States Steel Corporation was created in 1902, it was the largest corporation America had known up to that time. It produced twice as much steel as all of its domestic competitors put together. Today, the United States Steel Corporation produces about 20 percent of the steel that is made in this country.

52. In 1902, the United States Steel Corporation produced not less than 66 percent of the total domestic output of steel.
53. Today, domestic competitors produce more than three times as much steel as does the United States Steel Corporation.
54. The United States Steel Corporation produces less steel today than it did in 1902.

Pat had poor posture, had very few friends, was ill at ease in company, and in general was very unhappy. Then a close friend recommended that Pat visit Dr. Baldwin, a reputed expert on helping people improve their personalities. Pat took this recommendation and, after three months of treatment by Dr. Baldwin, developed more friendships, was more at ease, and in general felt happier.

55. Without Dr. Baldwin's treatment, Pat would not have improved.
56. Improvements in Pat's life occurred after Dr. Baldwin's treatment started.
57. Without a friend's advice Pat would not have heard of Dr. Baldwin.

Go on to the next page ▶

In a certain city where school attendance laws are strictly enforced, it was found that only 15 percent of the students had a perfect attendance record during a single school semester. Among those who sold newspapers, however, 25 percent had a perfect attendance record during the same semester.

58. Students who sold newspapers were more likely to have perfect attendance records during the semester than students who did not.

59. Strict enforcement of school attendance laws in this city did not prevent 85 percent of the students from being absent sometime during the semester.

60. If truants were given jobs selling newspapers, their school attendance would improve.

61. The low rate of perfect attendance by students in that school system was due mainly to illness or injury.

When I go to bed at night, I usually fall asleep quite promptly. But about twice a month I drink coffee during the evening, and whenever I do, I lie awake and toss for hours.

62. My problem is mostly psychological. I expect that the coffee will keep me awake and therefore it does.

63. I don't fall asleep promptly at night after drinking coffee because the caffeine in it overstimulates my nervous system.

64. On nights when I want to fall asleep promptly, I'd better not drink coffee in the evening.

Go on to the next page ▶

TEST 5: EVALUATION OF ARGUMENTS

DIRECTIONS

In making decisions about important questions, it is desirable to be able to distinguish between arguments that are strong and arguments that are weak, as far as the question at issue is concerned. *For an argument to be strong, it must be both important and directly related to the question.*

An argument is weak if it is not directly related to the question (even though it may be of great general importance), or if it is of minor importance, or if it is related only to trivial aspects of the question.

Below is a series of questions. Each question is followed by several arguments. *For the purpose of this test, you are to regard each argument as true.* The problem then is to decide whether it is a *strong* or a *weak* argument.

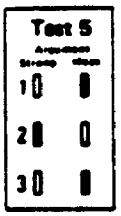
Make a heavy black mark on the answer sheet under "ARGUMENT STRONG" if you think the argument is strong, or under "ARGUMENT WEAK" if you think the argument is weak. Judge each argument separately on its own merit. *Try not to let your personal attitude toward the question influence your evaluation of the argument, since each argument is to be regarded as true.*

In the example, note that the argument is evaluated as to how well it supports the side of the question indicated.

EXAMPLE

Should all young men in the United States go to college?

1. Yes; college provides an opportunity for them to learn school songs and cheers. (This would be a silly reason for spending years in college.)
2. No, a large percent of young men do not have enough ability or interest to derive any benefit from college training. (If this is true, as the directions require us to assume, it is a weighty argument against all young men going to college.)
3. No; excessive studying permanently warps an individual's personality. (This argument, although of great general importance when accepted as true, is not directly related to the question, because attendance at college does not necessarily require excessive studying.)



When the word "should" is used as the first word in any of the following questions, its meaning is, "Would the proposed action promote the general welfare of the people in the United States?"

EXERCISES

Would a strong labor party promote the general welfare of the people of the United States?

65. No; a strong labor party would make it unattractive for private investors to risk their money in business ventures, thus causing sustained large-scale unemployment.
66. Yes; differences between Republicans and Democrats today are not as great as the differences between liberals and conservatives within those parties.
67. No; labor unions have called strikes in a number of important industries.

Should groups in this country who are opposed to some of our government's policies be permitted unrestricted freedom of press and speech?

68. Yes; a democratic state thrives on free and unrestricted discussion, including criticism.
69. No; the countries opposed to our form of government do not permit the free expression of our points of view in their territories.
70. No; if given full freedom of press and speech, opposition groups would cause serious internal strife, making our government basically unstable, and eventually leading to the loss of our democracy.

Should the United States Department of Defense keep the public informed of its anticipated scientific research programs by publicizing ahead of time the needs that would be served by each program?

71. No; some become critical of the government when widely publicized projects turn out unsuccessfully.
72. Yes; only a public so informed will support vital research and development activities with its tax dollars.
73. No; it is essential to keep certain military developments secret for national security and defense reasons.

Do juries decide court cases fairly when one of the opposing parties is rich and the other is poor?

74. No; because rich people are more likely to settle their cases out of court.
75. No; most jurors are more sympathetic to poor people than to the rich, and the jurors' sympathies affect their findings.
76. No; because rich people can afford to hire better lawyers than poor people, and juries are influenced by the skill of the opposing lawyers.

Should pupils be excused from public schools to receive religious instruction in their own churches during school hours?

77. No; having public-school children go off to their separate churches during school hours would seriously interfere with the educational process and create friction among children of different religions.
78. Yes; religious instruction would help overcome moral emptiness, weakness, and lack of consideration for other people, all of which appear to be current problems in our nation.
79. Yes; religious instruction is very important to the preservation of our democratic values.
80. No; religious instruction during school hours would violate our constitutional separation of church and state; those who desire such instruction are free to get it after school hours.

STOP.

You may go back and check your work.

Appendix B

Assertion Inventory

Assertion Inventory

Many people experience difficulty in handling interpersonal situations requiring them to assert themselves in some way, for example, turning down a request, asking a favour, giving someone a compliment, expressing disapproval, etc. Please indicate your degree of discomfort or anxiety in the space provided before each situation listed below.

Utilize the following scale to indicate your degree of discomfort:

1 = none
2 = a little
3 = a fair amount
4 = much
5 = very much

Then, go over the list a second time and indicate **after** each item the probability or likelihood of your displaying the behaviour, if actually presented with the situation. For example, if you rarely apologize when you are at fault, you would mark a "4" after that item.

Utilize the following scale to indicate your response probability:

1 = always do it
2 = usually do it
3 = do it about half the time
4 = rarely do it
5 = never do it

It is important to cover your discomfort ratings (*located in front of the items*) while indicating response probability. Otherwise, one rating may contaminate the other and a realistic assessment of your behaviour is unlikely. To correct this, place a piece of paper over your *degree of discomfort* ratings while answering the probability that you would display that behaviour if in that situation.

DEGREE OF DISCOMFORT	SITUATION	RESPONSE PROBABILITY
_____	1. Turn down a request to borrow your car.	1.
_____		
_____	2. Compliment a friend.	2.
_____		
_____	3. Ask a favour of someone.	3.
_____		
_____	4. Resist sales pressure.	4.
_____		

DEGREE OF DISCOMFORT 1 = none 2 = a little 3 = a fair amount time 4 = much 5 = very much	SITUATION	RESPONSE PROBABILITY 1 = always do it 2 = usually do it 3 = do it 1/2 the 4 = rarely do it 5 = never do it
_____ _____	5. Apologize when you are at fault.	5.
_____ _____	6. Turn down a request for a meeting or a date.	6.
_____ _____	7. Admit fear and request consideration.	7.
_____ _____	8. Tell a person you are intimately involved with when he/she says or does something that bothers you.	8.
_____ _____	9. Ask for a raise.	9.
_____ _____	10. Admit ignorance in some areas.	10.
_____ _____	11. Turn down a request to borrow money.	11.
_____ _____	12. Ask personal questions.	12.
_____ _____	13. Turn off a talkative friend.	13.
_____ _____	14. Ask for constructive criticism.	14.
_____ _____	15. Initiate a conversation with a stranger.	15.
_____ _____	16. Compliment a person you are romantically involved with or interested in.	16.

DEGREE OF DISCOMFORT	SITUATION	RESPONSE PROBABILITY
1 = none 2 = a little 3 = a fair amount time 4 = much 5 = very much		1 = always do it 2 = usually do it 3 = do it 1/2 the 4 = rarely do it 5 = never do it
_____	17. Request a meeting or date with a person.	17.
_____	18. Your initial request for a meeting is turned down and you ask the person again at a later time.	18.
_____	19. Admit confusion about a point under discussion and ask for a clarification.	19.
_____	20. Apply for a job.	20.
_____	21. Ask whether you have offended someone.	21.
_____	22. Tell someone that you like them.	22.
_____	23. Request expected service when such is not forthcoming, e.g., in a restaurant.	23.
_____	24. Discuss openly with the person his/her criticism of your behaviour.	24.
_____	25. Return defective items, e.g., store or restaurant.	25.
_____	26. Express an opinion that differs from that of the person you are talking to.	26.
_____	27. Resist sexual overtones when you are not interested.	27.
_____	28. Tell the person when you feel he/she has done something that is unfair to you.	28.
_____	29. Accept a date.	29.

DEGREE OF DISCOMFORT	SITUATION	RESPONSE PROBABILITY
1 = none 2 = a little 3 = a fair amount time 4 = much 5 = very much		1 = always do it 2 = usually do it 3 = do it 1/2 the 4 = rarely do it 5 = never do it
_____	30. Tell someone good news about yourself.	30. _____
_____	31. Resist pressure to drink.	31. _____
_____	32. Resist a significant person's unfair demand.	32. _____
_____	33. Quit a job.	33. _____
_____	34. Resist pressure to "turn on".	34. _____
_____	35. Request the return of borrowed items.	35. _____
_____	36. Receive compliments.	36. _____
_____	37. Discuss openly with someone his/her criticism of your work.	37. _____
_____	38. Continue to converse with someone who disagrees with you.	38. _____
_____	39. Tell a friend or someone with whom you work when he/she says or does something that bothers you.	39. _____
_____	40. Ask a person who is annoying you in a public situation to stop.	40. _____

Appendix C

Coopersmith Self-Esteem Inventory

Adult form of the Coopersmith SEI (1967)

To obtain information on the Coopersmith SEI or to purchase the inventory in the USA contact Consulting Psychologists Press, Inc., 577 College Ave., Palo Alto, CA, 94306. Their phone number is (415) 969-8901. In Canada, the inventory may be purchased through Psychometrics Canada Ltd., Room 103, Students' Union Building, University of Alberta, Edmonton, Alberta T6G 2J7. Their phone number is (403) 433-6467.

Appendix D

Personal Report of Communication Apprehension

PRCA

Directions: *This instrument is composed of 24 statements concerning your feelings about communication with other people. Please indicate in the space provided the degree to which each statement applies to you by making whether you:*
(1) Strongly Agree, (2) Agree, (3) Are Undecided, (4) Disagree or (5) Strongly Disagree with each statement. *There are no right or wrong answers. Many of the statements are similar to other statements. Do not be concerned about this. Work quickly, just record your first impression.*

_____ 1. I dislike participating in group discussions.

_____ 2. Generally I am comfortable while participating in a group discussion.

_____ 3. I am tense and nervous while participating in group discussions.

_____ 4. I like to get involved in group discussions.

_____ 5. Engaging in a group discussion with new people makes me tense and nervous.

_____ 6. I am calm and relaxed while participating in group discussions.

_____ 7. Generally, I am nervous when I have to participate in a meeting.

_____ 8. Usually I am calm and relaxed while participating in meetings.

_____ 9. I am very calm and relaxed when I am called upon to express an opinion at a meeting.

_____ 10. I am afraid to express myself at meetings.

_____ 11. Communicating at meetings usually makes me uncomfortable.

_____ 12. I am very relaxed when answering questions at a meetings.

_____ 13. While participating in a conversation with a new acquaintance, I feel very nervous.

_____ 14. I have no fear of speaking up in conversations.

_____ 15. Ordinarily I am very tense and nervous in conversations.

_____ 16. Ordinarily I am very calm and relaxed in conversations.

(1) Strongly Agree, (2) Agree, (3) Are Undecided, (4) Disagree or (5) Strongly Disagree

_____ 17. While conversing with a new acquaintance , I feel very relaxed.

_____ 18. I'm afraid to speak up in conversations.

_____ 19. I have no fear of giving a speech.

_____ 20. Certain parts of my body feel very tense and rigid while giving a speech.

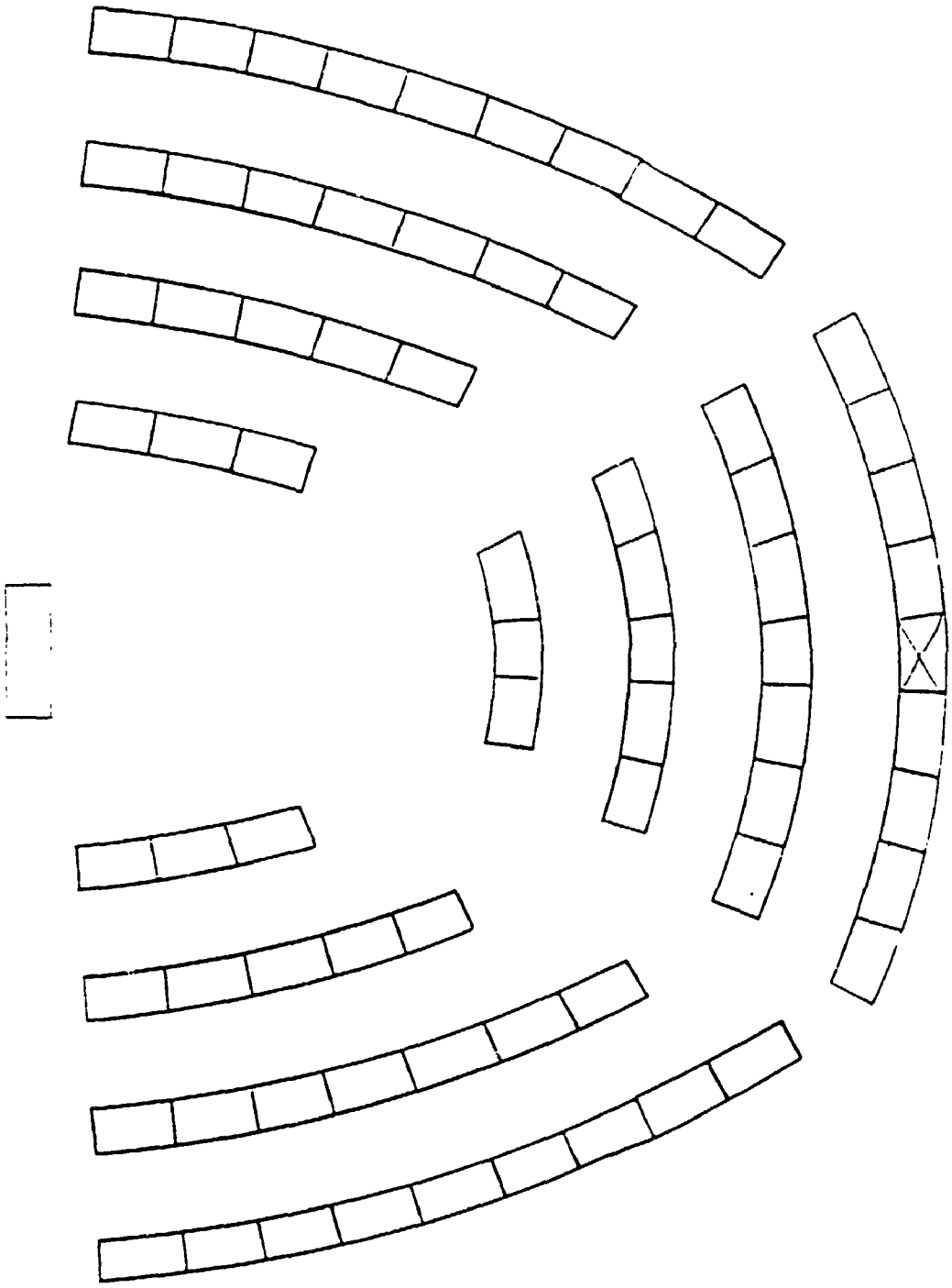
_____ 21. I feel relaxed while giving a speech.

_____ 22. My thoughts become confused and jumbled when I am giving a speech.

_____ 23. I face the prospect of giving a speech with confidence.

_____ 24. While giving a speech I get so nervous I forget facts I really know.

Appendix E
Class Plan



Appendix F
Unitizing Rules for Dialogue

Unitizing Rules

Separate units are denoted by the following:

A. Sentence Structure

B. Changes of content within the sentence.

Sentence Structure

A. Set off as a separate unit any sentence which identifies one complete thought.

Example: Watch Problem (units noted by slash marks):

"I have tried to retrace my steps for the immediate past./
Nothing occurs to me"/

Changes of Content within the Sentence

A. When a conjunction such as "and, but, because, although, so, or, since" appears, check the statement to see if there are two separate units on each side of the conjunction. If the conjunction is followed by an action verb, most often (not always) it will begin a separate unit.

Example: Restaurant Problem

"I would get someone else to introduce us/ or I would get in an activity with him where it would be natural to introduce myself.

B. In some cases, the presence of a conjunction does not denote separate units.

1. Do not unitize when the conjunction is in a list that accompanies one action verb.

   Example: Money Problem

   "I started by listing my income sources, day-to-day expenses, and present debts."/

2. Do not unitize when the meaning of statements joined by the conjunction requires that they stay as one unit to be understood. Often, even though there are two action verbs, they constitute one complete action.

   Example: Money Problem

   "I sit down with pad, pen, and calculator to rearrange my budget."/ (one unit)

3. Do not unitize when the statements on each side of the conjunction have the same meaning.

   Example: Teaching Problem

   "I talked to a few of the students in the class and asked them for suggestions to make things better."/ (one unit)

4. Do not unitize statements that contain, or are prefaced by, the conjunction "if" denoting suppositions or hypothetical conditions.

   Example:

   "After a few months, if it was going well, I would want to live together for a year."/

Appendix G

Problem-Solving Components Scoring Manual

Scoring Manual for Problem-Solving Components

Eight primary categories are used in coding the problem-solving components of student's utterances. After each transcript is unitized each unit is scored for its problem-solving components. Prior to beginning scoring the transcripts, the rater should carefully review all written case material. The eight categories are:

(1) Answers a direct question (**ANS**)

(2) States the problem (**PS**)

(3) Specifies the major problems or issues (**PI**)

(4) Performs numerical analysis (**NUM**)

(5) States strategies or Action Plans (**ST**)

(6) Elaborates on a strategy or situation (**EL**)

(7) States a reason (**RN**)

(8) Evaluates a strategy or plan (**EV**)

---

(1) **Answers a direct question** **ANS**

Students often answer direct factual questions in class which are closed-ended questions that only require a one-or two-word response such as yes or no. Responses should only be put in this category if they do not fit in any other category.

(2) **Problem statement** **PS**

The student describes the problem. This category often involves paraphrasing the case. According to Glover and Bruning (1987) this first step in problem solving is often a critical one. Until students can clearly understand what the problem is, their ability to solve the problem will be severely hampered. At this stage the student does not

engage in analysis or suggest any action plans.

For example: Student: *This employee has a history of absences that are somewhat sporadic. / (PS)*

or *It was the first time they have really been packaged this way and offered this way./ (PS)*

or *Lacy is responsible for the forthcoming market introduction of Pronto in New York City./(PS)*

The information contained in these utterances comes directly from the case.

(3) **Problem Issue** **PI**

At this stage, student's utterances reflect the beginning levels of analysing the case. They state the problems or issues in a case without giving a strategy or plan to deal with the problem. This category of problem-solving skill moves beyond simply reiterating what was in the case to the first step of analysis. The student moves from showing knowledge of the case to demonstrating comprehension.

For example: Student: *One of the first things that strikes me about pantyhose is that once you've taken them out of the package they all look alike/ (PI)*

or *I think one of the barriers you are going to come up against is the whole security issue/ (PI)*

(4) **Numerical Analysis** **NUM**

These are units where subjects perform calculation on figures in the text of the case to aid them in their analysis of the problem.

For example: Student: *For research and development the total is 66 million. / (NUM)*

or *Student: If they are thirty days late [in paying back the loan] than that increases their need [for money] by 10.5 million dollars./ (NUM)*

Sometimes the student will discuss what analysis was performed without telling the actual numbers. Nonetheless, the impression is that analysis of data has been performed. The case must be checked to ensure the student must perform some level of analysis to come up with the solution.

(5) **Strategy** **ST**

This component of problem solving involves stating strategies or approaches to a problem. They often involve delineating a specific plan for action.

For example: *Student: I could call him into my office and discuss the situation./(ST)*

or *I thought what they should do is have this digital [system] totally developed and ready for market before they even let this cat out of the bag./(ST)*

Strategies often involve "if then" statements, sometimes these words are silent (not said in the sentence) but must be placed in the sentence for the utterance to make sense.

(6) **Elaboration** **EL**

Elaboration often occurs about strategies or plans. It usually involves the continuation of the previous thought. It is not a separate strategy or thought. Therefore, elaboration often involves providing more details or description on a previous comment or simply rephrasing what the student has already said.

For example:Student: *Who do they want to target?/ (PI) Do they want to just keep it for highly educated users/ (EL) do they want to just target the people who are familiar with computers/ (EL).*

(7) **Reason** **RN**

This category is an often an explanation for a strategy. Explanations often start with because, so, that, since, to see, in order to etc. These comments do not involve judgement or evaluation.

For example:Student: *By talking with him I can get a straight answer and see where the relationship is at./ (RN)*

or *Because he didn't call to say he wasn't coming in. /(RN)*

or *If he goes with giving them exclusive rights then he is going to have to reevaluate his package/ (ST) because that is going to have an influence on the licensing package he is going to offer/ (RN)*

(8) **Evaluation** **EV**

With this problem-solving component the student will often evaluate or judge the effectiveness, feasibility or desirability of a strategy, plan or situation. Evaluations often start with the phrases " I think... or I feel ... or I believe"

For example: Student: *I think its pretty important that we do this, and let the customers know what is going on.(EV a ST)*

or *They are already selling their technical expertise to other banks/ (PS) and that is one*

slight advantage from Citibank that keeps the software packages in house (EV the situation).

or *I think it is going to make a very big difference" (EV the situation)*

Longer Examples

Student: *What you could probably do is guarantee to postpone the claim on the shareholder loan/ (ST) and then that $800,000.00 would no longer be active/ (RN) so I think you would be alright on that level/ (EV).*

Student: *They should address the question of whether they want to licence this [product] to other people/ (PI) Citibank is going alone on this/ (PS) It is a hell of a strategic advantage if it works/ (EV) Do they want to give that up to the other competition or not/ (EL).*

Student: *I would say they might even be jumping the gun/ (EV) because most of the banks they were targeting were smaller banks/ (RN) so maybe if they got a foothold first in New York and showed how it could be successfully run then Parker would have more success working in the institutional market/ (ST)*

Appendix H

Cognitive Level Coding Scheme

COGNITIVE LEVEL CODING SCHEME

Two categories were used in coding teacher-student interaction. They were high cognitive level utterance (HI) and low cognitive level utterance (LO). These categories are based on Bloom's (1956) taxonomy and assess the cognitive component of the interactions. Low level cognitive utterances also include praise or encouragement which typifies the short comments made in class by the teacher to keep the discussion rolling (Aschner, 1963).

In addition, each student or teacher cognitive level utterance will be also classified as a question(Q) or a statement(S).

Procedures used for classifying responses

Each successive participant's performance is classified according to the teacher-student interaction coding scheme. When several cognitive levels are displayed in a single speaking turn the unit is coded by the highest category displayed therein. For instance if a student summarizes a case(LOS) in some detail prior to giving his/her strategies for action(HIS) the entire speaking turn would be categorized as high cognitive level (HIS).

Low Level Cognitive Utterances

Low level cognitive utterances are related to the two lowest levels of Bloom's taxonomy: knowledge and comprehension. Knowledge as defined by Bloom (1956) involves the recall or recognition of previously learned material.

For Example: Student: *We have the normal promotion [which] was what we have doing already. Then we have the option of increasing the ads, then the 20 cents [off single*

pack offer], then the 40 cents [off twin pack offer]. Our normal monthly volume of these was 600,000 units.

This student's response is a paraphrase of information contained in the case.

Comprehension is the second level of the Bloom taxonomy. According to Bloom comprehension involves the individual's ability to understand what is being communicated and to make some use of the ideas or information being conveyed. It may involve the speaker making inferences or extrapolating from the information that they have been given. Thinking in these cases is based on concrete facts rather than on abstraction . For example. *Student: I think what we have to understand is the marketing objectives of L'Eggs and what, where they see they are now and where they expect to be.*

This student's comment shows comprehension and awareness of the issues in the case.

Therefore, Low Level Utterances may involve convergent thinking where the participant is required to give factual information or to summarize information previously presented in class (Redfield & Rosseau, 1981) or it may involve the speaker demonstrating comprehension of the issues or problems in a case. Teacher questions in this category tend to be closed ended and require short responses e.g., Yes/No questions fall in this category.

Example 1

Teacher: You're saying I get 20% of what did you say, $5,000? (LOQ)

Student: Yeah. (LOS)

The teacher in this example is paraphrasing the student and asking a low level, closed ended question. The student's response reflects this level of questioning.

Example 2

Teacher: You said earlier that debt will either be zero or all of it. (LOS)

Student: Yeah (LOS)

The low level summary statement given by the teacher elicits a one word response from the student.

Example 3

Teacher: Who are your customers at this point? In Canada you have got? (LOQ)

Student: Bell Canada (LOS)

The teacher asks a factual question whose answer can be found in the case.

Teacher comments which encourage participation from students or utterances which serve to indicate which student should participate next are also included under low level cognitive responses. This can be seen in the following two examples.

Teacher: That's alright. Okay Steve. (LOS)

Teacher: Go ahead (LOS)

As can be seen in the next example, humour may also be used to encourage student participation.

Teacher: You heard it here. Let me write that one down. (LOS)

Higher Level Cognitive Utterances

Higher level cognitive utterances(HI) are related to the four Bloom levels of application, analysis, synthesis and evaluation. Application is the third level of Bloom's (1956) taxonomy. It involves the "ability to apply principles to new situations" (p.48). Numerical analysis is included under application when the student must perform some analysis of figures presented in the case. Note that the case must be checked to ensure a calculation was performed by the student or the teacher. For example:

> Student: *The contribution for all these is five dollars normal and then with the discount per dozen it came ... out the contribution changes to $3.44 so that's five dollars less 12 times 13 cents which is how much L'Eggs has to absorb of the 20 percent discount. The contributions are $3.44 over here.*

This response satisfies Bloom's level of application in that the student not only shows knowledge of a procedure but correctly applies it without needing prompting about which procedure to perform.

Bloom states that a somewhat more advanced cognitive level than application is analysis. Analysis requires the participant to break down the problem into its constituent parts and to examine the relationship of the parts and the way they are organized. For example:

> Student: *There is an advantage ...that Haines has identified ... their total shelf space is larger than ours whereas in the grocery stores we are on an even par and actually they are going to have*

a hard time getting shelf space to go against us cause we are the market leaders and so we have actually more clout at grocery stores than they hold.

In this example, the student analyzes why it might be that the smaller company described in the case might still be competitive with a much larger company. He shows knowledge of some of the unstated assumptions present in the case.

In the next level of Bloom's taxonomy, synthesis, the speaker is required to tie together the various elements presented in a case often in the form of a plan. This level tends to require more creativity than the other levels of the taxonomy which have been discussed. For example:

Student: Use Hall as a marketing tool, promote him, see he's been using the technical side of it, and he should be using Hall's name on the product. They've also been selling to the lower end of the market whereas I think if I was a golfer, who was playing a lot of golf, I'd be looking at the top line in price.

In this example, the student shows knowledge of the case, analyzes the situation, and comes up with a creative plan to change how Hall is being utilized by the company in the case. Synthesis typically involves the participant combining elements of the case to form a novel plan for action.

The top level of Bloom's taxonomy is evaluation in which the speaker makes judgement explicitly based on criteria. For example:

Teacher: *What kinds of assumptions are we making about consumer behaviour when we offer this kind of deal and when are they appropriate and when are they not?*

Student: *We're making the assumption that by cutting the price it will entice people to buy the product ... the people that will buy this product are probably more price sensitive than the people that are going to go to department stores and pay three times as much... In my opinion their [the company's] goal is to increase trial and then it's [the offer] going to stop because they feel... once someone tries it, it will be worth their while to pay an extra 40 cents to continue using the product.*

In this example, the teacher asks the student to make an evaluation of a company's strategy. The student responds by evaluating the strategy in terms of the criteria given to her.

Therefore, it can be seen that Higher level utterances often require the participant to engage in divergent thinking or "to manipulate bits of information previously learned to create or support and answer with a logically reasoned response" (Redfield and Rosseau, 1981, p,237). Teacher questions in this category are likely to be open ended.

Examples.

(1) *Teacher*: *If you are McConnell here you've got two decisions to make about how you are going to react specifically to the Morse-Photo company account and then secondly after that reaction how do we translate that then into credit guidelines that*

*our credit officers within the trade-credit group can adopt? **(HIQ)***

*Student: I'd extend credit but only for $500 and maybe turn 2% and net 30. **(HIS)***

In this example, the teacher asks the student to come up with a specific plan for action to deal with a problem. The student must use synthesis to come up with a plan. The student responds with the strategy he would use in this particular situation.

*(2) Teacher: What is the likelihood that countries in the later category are likely to be interested in digital as opposed to analog technology? **(HIQ)***

In this second example, the teacher asks the student to evaluate a strategy that has been proposed in a case. This would require the student to make a judgement based on the information presented.

It is important to note that in making evaluations students must back up their responses with the appropriate reasons for that judgement. This is illustrated in the following example.

*(3) Student: It's a really good focusing tool in one way, too, because it points where you can improve to the maximum standard. It kind of reminded me of like a Japanese idea of not setting a quality standard because they are not looking at last year's market shares and saying we increased 10 percent, we are saying Jeez look at, we are bad in these areas so it is a real good incentive to the sales force if they use it correctly. **(HIS)***

Appendix I

Information Letter to Professors

Sept. 3, 1990.

Dear Prof. _____,

As you know, I am carrying out a research project for my Ph.D. dissertation designed to investigate the relationship of student characteristics to classroom participation and achievement in graduate Business Administration classes. The primary goal of the research is to determine the relationship of student characteristics such as assertiveness to classroom participation and business problem-solving skills.

The purpose of this letter is to solicit your cooperation to participate in my study. As part of my research I am examining the classroom interaction between instructors and students. Very little research has been performed in this area at the university level and case method classes seem an ideal environment to analyze class room participation. Although the primary focus of my research is to examine the students' development of problem-solving skills, I do need to code your questions in order to properly analyze the students' responses. You may be certain that any data you provide will be kept strictly confidential and used for research purposes only.

I would need to videotape your classes approximately three times over the next six months. The first time I would like to videotape your class would be this week. It is important that I collect some data on the students prior to their having had much exposure to the case method. I realize these first few weeks of classes are quite busy but I would appreciate hearing from you as soon as possible (ext. 4674). I will be working on registration until noon on Tuesday but should be in my office this afternoon. I would greatly appreciate hearing from you today.

I am enclosing a consent form for you to sign and return to me. Thank you for agreeing to participate in my study.

Sincerely,

Debra Dawson M.A.

Ph.D. Candidate

Appendix J

Information Letter to Student Participants

August, 1990.

Dear M.B.A. Student,

I am carrying out a research project for my Ph.D. dissertation designed to investigate the relationship of student characteristics to classroom participation and achievement in graduate Business Administration classes. The primary goal of the research is to determine the relationship of student characteristics, such as assertiveness, to classroom participation and business problem-solving skills.

The purpose of this letter is to solicit your cooperation in becoming a subject in my study. In the first stage of my research subjects will be required to complete four personality measures which have been found in the literature to be related to classroom participation. To complete these inventories would only take about one hour maximum of your time, and a return envelope is provided for your convenience. The M.B.A. chair, Prof. Jim Rush has been fully informed about this study, and has expressed strong support for this research. Also, you may be certain that any data you provide will be kept strictly confidential and used for research purposes only.

The second stage of my study requires me to videotape six of your classes throughout the year. I will be analysing the videotapes to investigate problem-solving in case method classes. Again, the data collected from these tapes will be utilized for research purposes only.

Finally, I will need access to your GMAT scores, Undergraduate Grades, Participation grades and Exam Grades in your first year MBA courses.

Although classroom participation has been found to related to achievement at the primary school level we know very little about participation at the university level. In particular, case method classes offer a unique opportunity to observe the classroom interaction of students. Therefore, your participation in this research would be greatly appreciated. Again, let me reiterate that any data gathered in this study would be kept confidential and would be used for research purposes only.

Thank you in advance for your cooperation. If you have any questions please feel free to call me at 432-6159.

Sincerely,

Debra Dawson M.A.

Doctoral Candidate

Appendix K
Demographic Information Sheet

Demographic Questionnaire

1. Name: _____

2. Age: _____

3. Sex: Male Female (Please circle)

4. Student Number _____

Educational History

1. Please list your degree(s) and your year(s) of graduation below.

_____

_____

_____

_____

Work Experience

1). How many years of work experience do you have? _____

2a). What was your last job title prior to returning to school?

_____

2b). Who was your employer?

_____

2c). How long were you employed in that position?

_____ years _____ months

Appendix L

Table of Simple Correlations

Among Student Characteristic Variables

Simple correlations among student characteristic variables

	GMAT	GPA	ENG	BUS	SSC	WGCTA	Assert	SEI	PRCA
GMAT	1.00								
GPA	.29*	1.00							
ENG	.21	.21	1.00						
BUS	.02	-.02	-.35*	1.00					
SSC	-.11	-.03	-.33*	-.35*	1.00				
WGCTA	.34*	.14	.08	-.06	-.16	1.00			
Assert	.08	.08	.09	-.09	.05	-.18	1.00		
SEI	-.08	-.04	.10	.13	-.28*	.05	-.27*	1.00	
PRCA	.11	.16	.02	-.03	-.02	.14	.37*	-.45*	1.00

* $p. < .05$

Note: GMAT= Graduate Management Admission Test score
GPA= Undergraduate Average
ENG= Undergraduate Engineering Degree
BUS= Undergraduate Commerce Degree
SSC= Undergraduate Social Science Degree
WGCTA= Watson-Glaser Critical Thinking Appraisal score
Assert= Assertion Inventory total score
SEI= Coopersmith Self-Esteem Inventory score
PRCA= Personal Report of Communication Anxiety score

Appendix M
Table of Correlations of Student Characteristics with Final Grades

Correlations of student characteristics with final grades

	Final Grades			
	Finance Participation Grade	Finance Course Grade	Marketing Participation Grade	Marketing Course Grade
Predictor Variables				
Degree Type				
Engineering	.29*	.50*	-.12	-.21
Commerce	.05	-.01	.24*	.15
Social Science	-.02	-.23	-.03	.23*
Undergraduate Average	.33*	.44*	.11	.17
GMAT	.03	.32*	-.14	-.02
SEI score	.18	.05	.14	.08
WGCTA score	.28*	.21	.17	.20
Assertiveness Response Probability score	-.06	-.01	-.13	-.11
Communication anxiety scale score	.02	.14	-.16	-.20

* p. <.05

Note: SEI-Coopersmith Self-esteem Inventory
WGCTA- Watson-Glaser Critical Thinking Appraisal

Appendix N
Table of Simple Correlations
Among Problem-solving Components

Simple correlations among problem-solving components

	PS	PI	NUM	ST	EL	RN	EV	ANS
PS	1.00							
PI	.60*	1.00						
NUM	.66*	.36*	1.00					
ST	.84*	.50*	.67*	1.00				
EL	.91*	.56*	.57*	.85*	1.00			
RN	.87*	.59*	.58*	.87*	.91*	1.00		
EV	.89*	.61*	.60*	.89*	.93*	.93*	1.00	
ANS	.74*	.40*	.69*	.84*	.75*	.80*	.81*	1.00

* p. <.05

Note: PS= problem statement
PI= problem issue
NUM= numerical analysis
ST= strategy
EL= elaboration
RN= reason
EV= evaluation
ANS= answer

Appendix O
Table of Correlations Between Cognitive Level of Student Responses and Course Grades

Correlations between cognitive level of student responses and course grades

Cognitive Level Frequency Variable	Final Grades: Finance Participation Grade	Finance Course Grade	Marketing Participation Grade	Marketing Course Grade
Finance low level responses	.31*	.09	.24*	.26*
Finance high level responses	.28*	-.06	.34*	.30*
Marketing low level responses	.29*	.21	.31*	.17
Marketing high level responses	.20	.06	.39*	.27*

* $p < .05$