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Combining Instructional Strategies: An Investigation of Bloom's Two Sigma Challenge in Instructional Design

Judith Linda Amato

A Thesis

in

The Department

of

Education

Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Arts at
Concordia University
Montréal, Québec, Canada

September 1988

ISBN 0-315-44819-9

ABSTRACT

Combining Instructional Strategies: An Investigation of Bloom's Two Sigma Challenge in Instructional Design

Judith Linda Amato

This thesis describes an instructional design project for undergraduate educational psychology. The design of the project followed principles of instructional systems technology, and incorporated three instructional strategies, in an attempt to achieve the two sigma effect described by Bloom (1984). This effect size (i.e., a mean of two sigmas above standard group instruction) is normally associated with one-to-one tutoring, and is, in theory, achievable when individual, group-oriented instructional strategies, with known effect sizes (estimated through meta-analytic studies), are combined. The instructional strategies used in this project were: cooperative learning (sigma =.8), enhanced student classroom participation (sigma = 1.0), and advance organizers (sigma = .2). The designed instructional unit was formatively evaluated, and its cognitive, affective, and sociometric outcomes experimentally assessed. Statistical analysis of the data revealed that the approach of combining the three instructional strategies did not result in an effect size of two sigma. The approach did, however, improve the cognitive achievement of low-aptitude learners, and did not adversely affect that of middle- and high-aptitude learners. The combined instructional strategies were also found to exert a positive influence on students' attitudes towards cooperative learning, as well as their ability to cooperate, and served to heighten social interaction within the classroom.

Dedication

To my parents, sisters and brother, without whose love and support I could not have completed this project; and to Jerry, for all the times he made me laugh.

Acknowledgements

I am indepted to my thesis supervisor, Bob Bernard, for all the time and energy he devoted to helping me through this project. I would also like to thank Bette DeBellefeuille, Miranda D'Amico, and Don Beckwith for the contributions each of them made towards this project. In addition, I would like to thank the three educational technology students who served as the one-to-one evaluators of the instructional unit, and Mary Genova, for all her assistance with the Macintosh. Finally, I would like to acknowledge the FCAR of the Quebec government, and the Teaching Module Development Grant of the Education Department, Concordia University, both of which funded the development of the instructional unit employed in the present study.

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CHAPTER 1

Introduction

The instructional design project on which this thesis focuses was initiated in October 1987, when the author was contracted to design an instructional unit for an undergraduate educational psychology course.

The course for which the instructional unit was designed was Psychology of Education (C210), a full-year, six credit course, offered at Concordia University in Montreal. Primarily a survey course, C210 aims to introduce students to the issues of how people learn, and how teachers instruct. Since the course is "required" for all education students, enrolment in it is predictably high: The course is divided into six sections, each containing some 50 students. For the most part, the students enrolled in C210 are either education students or psychology students, with the remainder of the participants being drawn from programmes as diverse as applied social sciences and biology. For some students, C210 represents a first course in psychology, while others will already have taken one or more psychology courses during their academic careers.

At its inception, the project in question was intended to embody principles of cooperative learning, with the resultant instructional package to be made up of cooperative learning activities and instructional materials. The initial impetus to introduce cooperative learning strategies into C210 came from two instructors of the course, responsible between them for three sections of C210. They were dissatisfied with the fact that, like most other university and school courses, C210 was composed of learning activities which were predominantly individualistic and competitive in nature. While this state of affairs had, in past years, resulted in the attainment by the students of acceptable cognitive gains, it had not provided them with the cooperative social interaction skills that, it was considered, they

would need upon entry into the work force. The instructors felt that the possession of such skills would be necessary in any field of employment that their students might pursue, and particularly necessary in that specific field pursued by the majority of C210 students, namely teaching. Accordingly, the instructors decided to make the attainment of these social interaction skills one of the main goals of C210. They determined that one way in which these skills could be taught would be through the implementation of cooperative group work in their classes. Moreover, the available literature concerning cooperative learning convinced them that the inclusion of cooperative group work in their classes might also result in improved cognitive gain scores on the part of their students, as well as greater satisfaction with, and enjoyment of, the course in general.

It was thus that the two course instructors decided that an instructional unit, specifically designed to enhance cooperative interaction among their students, should be developed for use during the 1987/88 academic year. They decided, in addition, that it would be expedient to have an instructional designer develop the unit, since this, they reasoned, would result in the production of a unit of instruction which would not only incorporate the desired cooperative learning strategies, but would also be based upon sound instructional principles. Since the idea of introducing cooperative learning into the C210 curriculum represented somewhat of an experimental venture (the outcome of which could not be guaranteed), it was agreed that the designed instructional unit would initially be run and evaluated in only two of the six sections of the course. In this way, the 1987/88 academic year could serve as an experimental testing of the unit's effectiveness. If a favorable outcome resulted, then the implementation of the unit across all six sections of the course would be recommended for subsequent years. Hence, the designed instructional unit was scheduled to be

implemented in sections A and C of C210, during the first half of the winter semester. The content to be covered by the unit consisted of Cognitive and Humanistic learning theories, as well as theories of Information Processing.

Although the project was initially intended to incorporate cooperative learning strategies solely, it progressed far beyond this boundary. As the project evolved, the inclusion therein of two other instructional strategies became both necessary and desirable. The two additional strategies were enhanced student classroom participation and advance organizers. The rationale behind their inclusion in the instructional unit is explained in Chapter 2 of this paper. In its final form, then, the designed instructional unit subsumed three instructional strategies: cooperative learning, student classroom participation, and advance organizers. It is the combination of these three instructional strategies within the instructional design project, that is the main focus of the present thesis.

It should be noted that, while it is possible to refer to a "main focus" for this thesis, the project described herein contains an inherent duality, in that it aimed to be both an instructional design as well as a quasi-experimental research endeavour, bent on investigating the effectiveness of combining instructional strategies. Accordingly, the evaluation procedures carried out in the course of the project do not only constitute a formative evaluation of the designed instructional unit, but also represent "formative research" into the notion of combining instructional strategies, as a method for achieving maximum instructional effectiveness.[1]

The realization of this rather ambitious project in a practical, "real life" setting was beset by a number of problems and constraints. These problems,

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1 Note: The term "formative research" has been derived from the work of Baggaley (1987). It is used here to denote the process of evaluating an instructional product, the results of which may be generalized to other (future) projects. In the present project, the evaluation procedures serve not only to assess design flaws in the unit, but also to answer the larger research question concerning the expedience of combining instructional strategies.

and the attempts to solve them, are addressed at various points in this paper. It is the author's hope that a discussion of the practical problems associated with this project will serve to aid future students who choose to undertake projects of a similar nature.

CHAPTER 2

Rationale and Review of the Literature

Introduction

Can instructional strategies be combined in higher education to produce methods of group instruction which are as effective as one-to-one tutoring? Over the past eight years, a small number of research endeavours have been directed towards answering this question at the primary and secondary school levels. The results of these experiments seem to suggest that the combination of certain strategies may indeed enhance group instruction, so that it becomes as effective in promoting cognitive gains as one-to-one tutoring (Bloom, 1984; Leyton, 1983; Nordin, 1981; Tenenbaum, 1982). Exposed to maximally effective instructional conditions (in which instructional variables have been combined), low aptitude students have been observed to achieve final cognitive scores surpassing those of high aptitude students under conventional group instruction (Bloom, 1984; Tenenbaum, 1982, 1986).

The educational implications of these findings are extremely profound since, if the results attained can be generalized, they will no doubt yield practical methods of group instruction - methods which can be widely applied with little more cost and time than conventional instruction - and completely change presently-held notions about human potential for learning (Bloom, 1984). Owing to the small number of studies that have thus far been conducted in this area, however, the question of whether or not the impressive results obtained in the lower grades may be replicated in higher education remains, as yet, unanswered. Moreover, little wisdom has emerged as to which two or three strategies can best be combined (B. S. Bloom, personal communication, April, 1988). It is precisely these issues that the present study attempts to explore.

The Two Sigma Challenge

> To think about how you teach is to think technologically, for technology means to think about how to use resources in different ways to achieve a given end. (Bereday, 1969, p.343)

The search for more effective methods of instruction may be considered to be one of the principal pursuits of the educational technologist. In educational technology, the ultimate question often is how to provide a specific learner, or group of learners, with the best possible instruction, so as to maximize the amount and quality of the resultant learning. The large body of research literature in the field of education attests to the countless attempts that have been made to answer this single question. One suggested solution that has been shown to be highly effective is one-to-one tutoring (Lippitt & Lippitt, 1968). The one-to-one tutoring method involves a teacher (or teacher's aide) working directly with an individual student on a body of information, using a strategy specifically developed to meet the learning needs of that student. Under these conditions, feedback from tutor to student is constant, immediate, and accurately responsive to the needs of the student. Recent studies by Anania (1983) and Burke (1983) have contrasted students' potential for learning under tutorial and group approaches to instruction. In these studies, four different samples of students at grades four, five, and eight were randomly assigned to three learning conditions: Conventional Instruction (teacher student ratio = 1:30); Mastery Learning (teacher-student ratio = 1:30; feedback-corrective procedures employed); and Tutoring (teacher-student ratio = 1:1; feedback-corrective procedures employed). In both studies, overwhelming support for the superiority of tutorial over group instruction was substantiated. After just three weeks, initially similar students were observed to exhibit dramatic differences in their ability and attitudes

towards the particular subject taught. Of particular note were the differences found in final achievement under the three conditions. The final achievement of the average tutored student was at a level above approximately 98% of the conventionally instructed students, while the average student under mastery learning attained final achievement scores above approximately 84% of the students in the conventional instruction condition. Expressed in terms of the standard deviation of the control group (i.e., conventional instruction), this means that the average tutored student performed at a level of two standard deviations above the average student under conventional instruction, and the average mastery learning student achieved a score of about one standard deviation above the average student in the control condition. Moreover, only 20% of the students under conventional instruction were successful in reaching the level of summative achievement attained by 90% of the tutored students, and 70% of the mastery learning students (Bloom, 1984). These differences held for both higher and lower mental processes, as defined by the Taxonomy of educational objectives (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956).

The results of the Burke and Anania studies show that under tutoring (and mastery learning) low aptitude students tend to achieve higher scores than high aptitude students exposed to conventional instruction. Burke (1983) explains these findings, asserting that the effectiveness of one-to-one tutoring lies in the fact that the instruction inherent in that method is fully adapted to the specific needs of each student. In conventional group instruction, on the other hand, the time and attention of the teacher must be divided among so great a number of students, that it is not possible to meet the specific needs of each individual within the group. The resultant learning that occurs is, therefore, full of errors, and far below the student's potential. In addition, as Bloom (1984) has noted, conventional instruction lacks the constant reinforcement, encouragement, and

students' active participation that is characteristic of the tutoring situation. Furthermore, in one-to-one tutoring, feedback from the student to the teacher regarding the clarity of the latter's explanations is at a maximum, while in conventional instruction, it is typically derived from only a small number of high-achieving students.

While one-to-one tutoring is clearly an effective method of instruction, it is too costly to be considered an "efficient" instructional strategy. For this reason, it has not been widely applied in schools and universities. Instead, various other methods have been proposed over the past 25 years, in an attempt to deal with differences in the learning needs of individuals. These methods (known collectively as "individualized instruction") include such strategies as Glaser's Individually Prescribed Instruction (IPI), Computer Aided Instruction (CAI), Keller's Personalized Systems of Instruction (PSI), and the various forms of Mastery Learning proposed by Carroll (1963), Bloom (1968), and Block (1971). Each of these more cost-effective methods has attempted, in slightly different ways, to mimic the characteristics that render one-to-one tutoring educationally effective; And indeed, each has succeeded in enhancing learning. However, none of these approaches have achieved the high level of effectiveness associated with one-to-one tutoring. Mastery learning, for example, has been found, under good conditions, to be only half as effective as one-to-one tutoring (Anania, 1983; Burke, 1983).

In recent years, Bloom's fascination with the instructional potency of one-to-one tutoring has led him to search for some way of devising teaching-learning conditions that would enable the majority of students in a group situation to achieve the high level of learning normally attained through one-to-one instruction. It is this search that Bloom (1984) has termed the "two sigma problem" or "two sigma challenge".

Work towards uncovering possible solutions to the two sigma problem began in the late '70s, when Bloom, along with a group of graduate students at the University of Chicago, began to summarize the literature on educational variables (Bloom, 1980). The attempt was to explore in the literature all of the factors which influence affective, behavioral and cognitive learning, and to contrast the more alterable variables with the more static or stable ones. By "alterable variables" it is meant those factors which can, in some way, be manipulated and changed by educators (e.g., quality of teaching, time on task, etc.) as opposed to the more unalterable factors such as socioeconomic status, teacher's personal characteristics, etc. While isolating the variables over which educators could exert the strongest influence, Bloom and his students also identified the methods and processes by which these variables could be altered. Drawing on meta-analytical research studies, they then defined the effect on learning that each of the identified alterable variables had been experimentally shown to exhibit. In this endeavour, they were aided by the work of Walberg and his associates who, in parallel research, carried out quantitative syntheses of almost 3000 studies, in an attempt to identify the factors most influential in promoting learning (Walberg, 1984; Walberg & Shanahan, 1983).

The reviewed meta-analyses provided a summary of the research literature on each alterable variable, and a calculated "effect size" on learning for each. These "effect sizes" are standardized quantities, expressed in standard deviations, and calculated by dividing the difference between the means of the experimental and control groups by the standard deviation of the control group (i.e., effect size = mean experimental - mean control/sigma of control). Table 1 has been adapted by Bloom (1984) from Walberg (1984), and summarizes the effect of selected alterable variables on student learning. The variables listed have been classified by Bloom in terms of the direct object that they influence or

change. These include: (a) the learner; (b) the instructional material; (c) the home environment or peer group; and (d) the teacher and the learning process. Percentile equivalents for each effect size have also been provided.

Table 1: Effect of selected alterable variables on student achievement

Object of change	Variable	Effect size	Percentile equivalent
D	Tutorial instruction	2.00	98
D	Reinforcement	1.20	
A	Feedback-corrective (ML)	1.00	84
D	Cues and explanations	1.00	
A/D	Student classroom participation	1.00	
A	Student time on task	1.00	
A	Improved reading/study skills	1.00	
C	Cooperative learning	.80	79
D	Homework (graded)	.80	
D	Classroom morale	.60	73
A	Initial cognitive prerequisites	.60	
C	Home environment intervention	.50	69
D	Peer and cross-age remedial tutoring	.40	66
D	Homework (assigned)	.30	62
D	Higher order questions	.30	
D/B	New science & math curricula	.30	
D	Teacher expectancy	.30	
C	Peer group influence	.20	58
B	Advance organizers	.20	

Note: A=the learner; B=the instructional material; C=the home environment or peer group; D=the teacher

As one would expect, the numerous variables which influence learning are not all equally effective. Moreover, none of them even approximate the effect size associated with tutorial instruction. This fact convinced Bloom and his

students that no single variable on its own would provide a solution to the two sigma problem. They therefore speculated that it might be possible to combine certain variables together, in such a way that their effect sizes would be additive. Theoretically, they reasoned, this procedure would enhance group instruction, and enable it to yield an effect size approximating, or even exceeding, two sigma (Bloom, 1980; Bloom, 1984). The belief was that the combination of two or three instructional strategies, each with its own separate effect size, might produce a cumulative effect on learning. Hence, the separate effects of mastery learning (effect size = 1.0) and another variable, such as cues and explanations (effect size = 1.0) would tend to be additive when combined (effect size = 2.0). This procedure of combining instructional strategies has therefore emerged as one possible solution to the two sigma problem.

Combining Instructional Strategies: What the Literature Says

To date, the literature addressing the notion of combining instructional strategies is, in Bloom's own words, "still very crude" (B. S. Bloom, personal communication, April, 1988). Indeed, there exists only a small number of studies which have thus far attempted to combine instructional strategies in an effort to devise methods of group instruction as effective as one-to-one tutoring. Although small in number, these studies have been successful in enhancing the effects of group-based instruction on the cognitive and affective learning of individuals, and have challenged presently-held notions regarding students' potential for learning (Bloom, 1984; Nordin, 1981; Tenenbaum, 1986).

As mentioned previously, little is known about which instructional variables may be most effectively combined. Bloom (1984) has speculated that the combination of variables involving different aspects of the change process (see Table 1) is more likely to produce additive results than is the combination of

variables involving the same object of the change process. Several of the studies attempted so far have adopted this speculation as the basic rule of thumb on which they have based their choice of combination variables (Nordin,1981; Mevarech, 1985; Tenenbaum, 1982, 1986). Nordin (1981) conducted a study on 328 sixth grade students in rural Malaysia, in which he exposed students to varying degrees of enhanced instruction, and to unenhanced instruction. In this study, ten intact classes were randomly assigned to four experimental and one control condition. The experimental conditions included enhanced cues (sigma = 1.0; change object = teacher), enhanced student classroom participation (sigma = 1.0; change object = learner), enhanced cues plus participation, and a feedback-corrective condition (i.e., mastery learning). The control group consisted of conventional instruction, unenhanced in any way. Nordin hypothesized that the final achievement scores of the subjects exposed to the enhanced instructional conditions would exceed those attained by the control group, and that a similar pattern of results would emerge for subjects' interest in the content areas studied, as well as for their involvement in learning. The outcomes of the study provided support for all of the above research hypotheses. Particularly impressive were the cognitive achievement findings reported by the study. Nordin found that the final achievement score of the average student in the enhanced cue plus participation condition was 1.5 sigma above that of the average student under conventional instruction. That is to say, the average student in the combined instructional strategy condition performed better than 93% of the students in the control condition (Nordin, 1981).

Equally impressive achievement results have been reported by Tenenbaum (1982; 1986), who, like Nordin, has combined variables involving different aspects of the change process. Students in two grade levels (ninth and sixth), studying two different subject areas (algebra and science), were randomly

assigned to three different group-based instructional conditions. These were: a) enhanced cues, participation, reinforcement and feedback-corrective procedure (CPR + ML), a "maximal" instructional condition; b) conventional group instruction, a "minimal" method of group instruction which is not adaptive to the individual needs of students; and c) mastery learning, a method of group instruction which lies between the two extremes, and employs a feedback-corrective procedure. In both contexts, overwhelming support was found for the use of the combination instructional strategy. After a mere four to eight weeks, 74% of the students under the so-called "maximal" condition attained the level of final achievement reached by only the top 17% of the students exposed to conventional instruction, and by 57% of the students under mastery learning alone. In essence, the final achievement score of the average student in the combined CPR + ML instructional condition was above 96% of the students in the control group. Expressed in terms of the standard deviation of the control group, the final achievement scores of the students exposed to the combined instructional strategy was about 1.7 sigmas above the scores of the control group.

In both the Nordin and Tenenbaum studies, low correlations were detected between prior and final achievement in the subject areas studied. Tenenbaum (1986) reports that the correlation between prior and final achievement in the enhanced CPR + ML condition was extremely weak (about 8% common variance), whereas under conventional instruction, the correlation was relatively high (about 60% common variance). In Nordin's (1981) study, the variance accounted for by the correlation of aptitude with summative achievement was observed to be a mere 6% for those students exposed to the combined instructional strategy, while the variance accounted for by the correlation of the same measures under conventional instruction was 66%.

Nordin draws the conclusion that enhanced instruction allows a larger proportion of students to achieve a high level of cognitive learning than does conventional instruction, regardless of students' initial aptitude for the subject. Nordin (1981) also shows the existence of a weak correlation between intelligence and achievement under the combined instruction condition (48%, as opposed to 67% under conventional instruction), although this relationship is somewhat stronger than that observed under mastery learning alone (35%). The results of the Nordin and Tenenbaum studies suggest that the powerful effects of intelligence and aptitude may be minimized by improving the quality of instruction provided to students. Thus, when the instructional situation is at a maximum, it is the quality of the instruction, and not the intelligence nor aptitude of the students, which becomes the most accurate predictor of cognitive achievement.

It should be noted that the principle of combining variables which involve different objects of the change process may be substituted for another "rule" of variable combination, namely, that variables involving the same object of the change process may be combined, provided that they occur at different times in the teaching-learning process (Bloom, 1984). To date, only one study has been conducted in which the latter of the two rules has been applied (Leyton, 1983). As with the above studies, the main purpose of the Leyton study was to develop a method of group instruction as effective as the one-to-one tutorial method. However, whereas the instructional strategies combined in the former studies involved different objects of the change process, those combined in the latter study involved the same change object (specifically, the student). Two samples of ninth grade students (one studying French as a Second Language, and the other studying Algebra) were each randomly assigned to one of four different instruction conditions. These were: a) enhanced initial cognitive prerequisites plus mastery learning, a "maximal" method of group instruction; b) conventional

group instruction, a "minimal" method of instruction; and two intermediate methods, c) mastery learning; and d) conventional group instruction supplemented with enhanced cognitive prerequisites. Enhancement of initial cognitive prerequisites was achieved by way of a method closely resembling the feedback-corrective procedure that characterizes mastery learning: Firstly, subjects' possession of the initial cognitive prerequisites for French 2 and Algebra 2 was assessed by way of the final examinations in the previous courses (i.e., French 1 and Algebra 1). Next, the students were helped to review and relearn any of the specific prerequisites which they lacked, and then retested on the prerequisite skills. Any students who still did not reach the mastery standard (80%) were then given further assistance. Leyton (1983) found that after 10 to 12 weeks, the cognitive post-test scores of the subjects in the enhanced prerequisite group was .6 sigma above those of the control group, while the cognitive achievement of subjects under mastery learning alone exceeded by 1.0 sigma that of the control group. When the two strategies (enhancement of cognitive prerequisites and mastery learning) were combined, their separate effects added together to produce cognitive achievement that was approximately 1.6 sigma above the control group. This means that the average student in the combined instructional condition performed at a level that was above 95% of the students in the control condition.

It should be noted that the procedure of combining instructional strategies has been found to exert positive cognitive effects on both lower mental processes (such as knowledge and comprehension) and higher mental processes (such as application, analysis, and synthesis) (Mevarech, 1980, 1985; Tenenbaum, 1982, 1986). Mevarech (1980) has noted that teaching methods which aim to promote either higher or lower mental processes may be considerably enhanced by the addition of mastery learning procedures.

Similarly, in Tenenbaum's (1986) study, statistically significant differences between the enhanced CPR + ML groups and the conventional groups were detected for both higher and lower mental processes. Moreover, in a second study carried out by Mevarech (1985), the positive effects of a combined student-team (i.e. cooperative) and mastery learning instructional strategy on the mathematics achievement of fifth grade students were recorded for both computation and comprehension tasks.

Despite this benefit to both types of mental processes, it appears from the above studies that the advantage of combining instructional strategies is somewhat greater for higher mental processes than for lower ones (Bloom, 1984; Tenenbaum, 1986). For example, Tenenbaum (1986) reports that only 8% of the students exposed to conventional instruction in his study reached the mastery criterion (80%) on higher mental processes, as opposed to 69% under the enhanced CPR + ML condition. Substantial but somewhat smaller differences were obtained on lower mental processes, where about 38% of the control students, and 85% of the combination strategy students attained mastery.

In addition to the dramatic effects observed for cognitive achievement, the process of combining instructional strategies has also been shown to have beneficial effects on selected affective outcomes. Tenenbaum (1982) has noted that on the average, students exposed to the maximal cue, participation, reinforcement plus mastery learning method of group instruction became 22% more positive towards themselves as learners, the subject matter studied, their teacher and school than were their counterparts in the control condition. Other attitudinal benefits reported in the literature include enhanced self-concept, greater interest in the subject, and a greater desire to learn (Bloom, 1984; Leyton, 1983). These affective benefits, while significant, do not match the strength of the cognitive outcomes that have resulted from the combination of instructional strategies.

To date, there has been only one study conducted on the two sigma problem which has not been successful in achieving additive cognitive achievement effects. Mevarech (1985) combined a cooperative learning strategy, known as student-team learning, with mastery learning, and compared the instructional effectiveness of this combination with each of the two strategies separately, as well as with conventional instruction. The results of the study indicated that on computation tasks, students exposed to the combination condition were outperformed by those exposed to mastery learning alone, and did no better than students under student-team learning only. Moreover, on comprehension tasks, students exposed to the combined team-mastery strategy did no better than those exposed to mastery alone. Although students in the combined team-mastery and mastery alone conditions did significantly better than those in the control group on both computation and comprehension tasks, these differences were not as strong as one would have predicted from the effect sizes associated with each of the implemented strategies by the meta-analytical literature (see Table 1). The overall effect size obtained in this study for mastery learning was approximately .7 sigma (as opposed to the predicted 1.0 sigma), and that obtained for the combined team-mastery strategy was about .5 sigma (as opposed to nearing 1.8 sigma (cooperative learning = .8 sigma; mastery learning = 1.0 sigma)). Mevarech (1985) makes no attempt to explain these unusual outcomes. Indeed, it is not clear why mastery learning on its own would produce a stronger effect on computation than when combined with a second instructional strategy. One possibility raised by the results of the Mevarech study is that the effect sizes attributed to the alterable variables are simply inconsistent. Drawn from meta-analytic studies, these effect sizes are calculated averages of the effect sizes observed for each variable under a number of different conditions, school levels, sample sizes, etc. Although the individual effect sizes

are said to be quite robust (especially in terms of the more powerful factors which tend to benefit all students in all conditions), we know from research that, under certain conditions, some students will sometimes benefit more than others (Walberg, 1984). That is to say, not every experiment will yield the same results. Some studies will therefore report larger effect sizes than the averages cited in Table1, while others will find smaller effects than the given averages. What this means is that variables used for combination cannot be relied upon to produce effect sizes consistent with those reported in the meta-analytical literature. Hence, one may go to the effort of combining two strategies, only to find that their cumulative effect size is smaller than that of another strategy, acting on its own. This was the case in the study conducted by Nordin (1981), where mastery learning procedures employed on their own produced even greater cognitive achievement than the enhanced cues plus participation procedures. In light of the differential effect sizes that may be obtained for any one strategy under a variety of conditions, Walberg (1984) suggests that researchers consult the relevant literature, and thereby discover the conditions under which a specific strategy can be expected to yield a particular effect size.

With the exception of the Mevarech (1985) study described above, research on the effects of combining instructional strategies has been extremely successful in substantiating the pedagogical merits of the approach. These studies show clearly that, by combining instructional strategies, it is indeed possible to devise methods of group-based instruction which approximate the educational effectiveness of one-to-one tutoring. Perhaps the greatest revelation of the studies conducted to date is that, under the most effective instructional conditions that can be devised, low aptitude students will achieve at higher levels than students of higher aptitude who receive conventional instruction (Burke, 1983; Leyton, 1983; Tenenbaum, 1986). This revelation points to the high

degree to which the learning outcomes attained by students are a function of the quality of the instruction that they receive. Bloom (1976) has noted that, "We can only determine the full limits of what the student can and will learn when we have provided qualities of instruction which are optimal for the individual learner." While group-based instruction remains an economic necessity in most societies today, in its conventional form, it fails to provide optimal qualities of instruction, since it is not sufficiently adapted to the individual needs of students (Anania, 1983). An essential direction for research in education, therefore, is to discover methods of altering, and thereby enhancing, the quality of group-based instruction. It is precisely this which the above-cited studies on combining instructional variables have succeeded in doing. The implications of these findings for schooling are extreme, since they suggest that, if learning is to be effective, current methods of group-based instruction should be revised to include a combination of strategies which together are more accurately adapted to the learning needs of individual students.

Despite the impressive cognitive outcomes attained in the foregoing literature, there are several issues regarding the combination of instructional variables which remain unclear. First of all, it is not yet known whether the cumulative effect sizes obtained in the above studies may be replicated with older students. To date, none of the studies that have combined instructional strategies have involved college or university level students. Despite the effort made by Bloom and his graduate students to obtain generalizable findings by investigating, in almost every study, the effects of variable combination in at least two levels of schooling, and two subject fields, these investigations have, nevertheless, been confined exclusively to elementary and high school students. To complicate matters even further, the meta-analyses on which are based the estimated effect sizes of the alterable variables, rely heavily - indeed, almost

entirely - on studies conducted in the elementary and secondary sectors (Lysakowski & Walberg, 1981; Walberg, 1984). Thus, the extent to which the calculated effect sizes persist in higher education is uncertain. Further research on the two sigma problem should therefore aim to investigate the effectiveness of variable combination in higher education.

A second issue which remains unclarified by the research on combining instructional strategies concerns the essential process of selecting combination variables. Although Bloom (1984) has indicated the existence of two guiding principles for the selection of combination variables, he also concedes that these two rules are little more than "suggestive" at present, and that further research is required before a stronger set of generalizations may be devised regarding how separate strategies may best be combined. In fact, so little is presently known about variable combination that, even by following the above-noted rules, researchers run the risk of combining strategies whose outcomes somehow tend to be subtractive instead of additive. This may explain the negative results reported by Mevarech (1985). Clearly, there is much which remains to be discovered regarding the appropriate combination of instructional strategies.

In their work so far, Bloom and his students have restricted their selection of instructional strategies to variables which have an effect size of .5 or greater. It is still unknown, therefore, whether variables with low effect sizes may be effectively combined. Furthermore, in all but one of the studies conducted to date (i.e., Nordin, 1981), mastery learning has been employed as one of the combination variables. It may quite reasonably be argued that, if the essential motivation behind the idea of combining instructional strategies is to emulate the one-to-one tutorial method, then it follows that mastery learning - the single strategy which most closely resembles one-to-one tutoring - may well be a necessary component of the combination procedure. The study conducted by

Nordin (1981) refutes this argument, however, since the additive effect on achievement observed in this study was obtained without the use of mastery learning as one of the combination variables. Further research involving combination variables other than mastery learning will be necessary, before the relative importance or unimportance of the mastery learning strategy to the combination procedure becomes clear.

A final issue which requires clarification in future research, concerns Bloom's (1984) classification of instructional variables into four distinct categories. Closer inspection of the variables listed in Table 1 raises the question of whether the direct object of the change process associated with each variable is as absolute and exclusive as implied by Bloom. For example, cooperative learning may not only directly affect changes in the peer group (see Table 1), but, given that it involves small group work which is often carried out within class time, it will almost always also affect a degree of change in the role of both the teacher and the learner, and may even necessitate considerable changes in the instructional materials employed. Similarly, peer and cross-age remedial tutoring may be seen as involving dramatic changes in the role of the peer group, to the same extent as it affects changes in the role of the teacher. While Bloom does recognize the potential of two variables (namely, student classroom participation and new science & math curricula) to directly change more than one object, he makes no indication of this possibility among any of the other variables. It is possible, then, that by following Bloom's classification system, researchers intending to select variables affecting different objects of the change process, might inadvertently choose variables with overlapping change objects. The outcomes of such a selection process, and the implications of these outcomes on the validity of Bloom's classification system, remain to be investigated. It should be noted that one of the intentions of the present study was to explore further the issues described above.

The Current Project

Having reviewed the available literature concerning the combination of instructional strategies, a description of the current project is now provided. In the following pages, a description is provided of the three strategies combined in the present study, together with a brief review of the literature pertinent to each. The rationale behind the inclusion of these three specific instructional strategies in this project is then discussed. In a third section, a number of additional concerns of the study, totally unrelated to the two sigma challenge, are introduced to the reader. Finally, the overall intentions of the current project are presented, and the research hypotheses of the study stated.

The Instructional Strategies (Variables)

Three instructional strategies, each involving different aspects of the change process, were combined in the present study. These were: cooperative learning (effect size = .8 sigma; direct object of change process = peer group); student classroom participation (effect size = 1.0 sigma; direct object of change process = teacher and learner); and advance organizers (effect size = .2 sigma; direct object of change process = instructional material). Each of these strategies is described below:

Cooperative learning. According to Johnson and Johnson (1983), there are three ways in which instructional goals may be structured in the classroom: cooperatively, competitively, and individually. In a learning situation which is cooperatively structured, students' goal attainments are positively correlated, so that students are only able to obtain their goal if the other students with whom they are cooperatively linked obtain their goals. In a competitively structured learning situation, on the other hand, students' goal attainments are negatively

correlated, so that a students' goals can only be achieved if the other students with whom he/she is competitively linked fail to achieve their goals. Finally, in an individually structured learning situation, the goal attainment of a student is unaffected by that of other students (Johnson & Johnson, 1978).

The literature is replete with experiments which have contrasted the effects of cooperative, competitive and individualistic incentive structures on individual and group productivity (Slavin, 1983). Indeed, the question of cooperative versus competitive incentive structures is one of the oldest themes in social psychology, with research on the topic dating back to the early 1900s (Johnson & Johnson,1974; Maller, 1929; Slavin, 1977). It has only been in the past fifteen years, however, that research on practical classroom applications of cooperative principles has been carried out. In these studies, cooperative learning has typically been defined as an instructional technique or strategy that entails cooperative task structures, in which students work cooperatively together in small (4 - 6 member) heterogeneous groups (Slavin, 1983). In this situation, task completion is contingent upon the mutual cooperation of group members. Cooperative learning methods also make use of cooperative incentive structures, by which students earn recognition, rewards, and sometimes even grades, based on the academic performance of their groups (Slavin, 1983).

To date, the literature regarding the effects of cooperative learning in the classroom suggests that the strategy has a strong capacity to promote a wide variety of academic and social competencies (Moskowitz, Malvin, Schaeffer & Schaps, 1985). The reported benefits of the approach have included improved interpersonal relationships (Blaney, Stephan, Rosenfield, Aronson & Sikes, 1977; DeVries & Slavin, 1978; Garibaldi, 1979) such as cross-ethnic relationships (Cook, 1978; Hansell & Slavin, 1981; Weigel, Wiser & Cook, 1975), cross-sex relationships (Slavin, 1985), and greater acceptance of handicapped students

(Johnson & Johnson, 1983; Johnson, Johnson & Rynders, 1981; Madden & Slavin, 1983). Cooperative learning has also been found to increase students' attitudes towards themselves (Blaney, et al., 1977) their peers, their teachers and their schools (Duin, 1984; Sharan, 1980). In terms of its effect on cognitive achievement, however, the superiority of cooperative learning over competitive or individualistic structures is somewhat less certain. There is considerable disagreement as to the direction of the effect of cooperative learning on academic performance. While several meta-analyses have asserted the superiority of cooperative structures for all but the most concrete, repetitive tasks (Johnson & Johnson, 1974; Johnson, Maruyama, Johnson, Nelson & Skon, 1981; Sharan, 1980), Michaels (1977) has reviewed much of the same literature, only to conclude that individual competition consistently produces greater achievement than group conditions. Even the strongest supporters of the cooperative approach have recognized the discrepencies among the research findings regarding the relative effectiveness of cooperative and individual structures on cognitive achievements (Webb, 1985). To explain these inconsistencies, researchers have pointed to the varying characteristics of cooperative learning methods, settings, experimental designs, learning tasks, (Slavin, 1983), student characteristics, subject matter (Sharan, 1980) and interaction processes (Webb, 1985). In defense of the cooperative approach, Slavin (1983) has shown that in so far as studies on cooperative learning share certain essential methodological characteristics, the cognitive achievement outcomes that they obtain tend to be, on the whole, positive. In his comprehensive review of the literature, Slavin (1983) shows that, of 41 studies conducted in regular classroons, 63% have found significantly positive achievement effects favouring cooperative learning, and only one has found greater learning in the control group.

Achievement results reported in several cooperative learning studies have also suggested that the approach has a tendency to influence aptitude by treatment interactions. These aptitude by treatment effects are as likely to favour high ability learners (e.g., Hulten & DeVries, 1976; Webb & Kenderski, 1982) as they are to favour low ability learners (e.g., Edwards, DeVries & Snyder, 1972; Slavin & Oickle, 1981). Some studies have even noted curvilinear interactions, where both high and low ability students were observed to benefit from cooperative group work, while average achievers appeared to learn best on their own (e.g., Peterson, Janicki & Swing, 1981; Webb, 1977).

Research on the effects of cooperative learning has, for the most part, been conducted in elementary and high schools. Only a smaller proportion of the literature is made up of studies which have involved college and university students. Where they have been conducted, however, these studies suggest that cooperative learning tends to positively influence the achievement and attitudes of college and university students, (Fraser, Beaman, Diener & Kelem, 1977). Haines and McKeachie (1967) have shown that the in-class performance of students in an introductory psychology course at the University of Michigan increased when they were exposed to cooperative learning methods. In addition, lower tension levels and higher satisfaction with learning sessions were observed when a cooperative atmosphere was created. More recently, McClintock and Sonquist (1976) observed that university students in an introductory sociology research methods class, who had received low grades on their midterm examination, and who subsequently worked in groups, tended to do better on the final exam than their counterparts who had worked as individuals throughout the course. Such positive results have been obtained for college and university students studying a wide variety of subject areas, including engineering (Smith, Johnson & Johnson, 1981), teacher training (Cox, 1984), writing (Duin, 1984), and medicine (Hamilton, 1976).

It should be noted that the cooperative learning instructional strategy is made up of a variety of different methods. The most extensively used and researched methods are the Student Team Learning methods developed by DeVries, Slavin, and Edwards (Slavin, 1980). These methods include Student Teams Achievement Divisions (STAD), Teams-Games-Tournament (TGT), Jigsaw II, and Team Assisted Individualization (TAI). Other methods include Aronson's (1978) Jigsaw strategy, the Johnsons' (1975) Learning Together model, and Group-Investigation, developed by Sharan (1976). While all of these methods share the basic characteristic of involving students in group work in order to accomplish a group goal, in every other way, they are different (Slavin, 1983). STAD, TGT, and TAI are highly structured, and entail clearly specified group tasks and group rewards, as opposed to Group-Investigation and Learning Together, which grant greater autonomy to students, and have less well specified group rewards. The original version of Jigsaw also does not include formal group rewards. Both forms of Jigsaw are used primarily in social studies, while TAI is employed exclusively for mathematics, and STAD, TGT, and Learning Together are used in all subjects. Unlike the other methods, STAD, TGT, and Jigsaw II make use of competition between groups as a way of motivating students to cooperate within their groups. Given these differences, it is not surprising that major inconsistencies have been reported in studies regarding the effects on cognitive achievement of the various cooperative methods (Webb, 1985). The literature suggests that methods which employ specific group rewards, based on group members' individual learning performances, and which stress individual accountability, are more effective at improving cognitive achievement than methods which do not (Slavin, 1983). Moreover, Slavin (1983) argues for the superiority of methods in which each group member is given a particular part of the group task to do, such that group members are forced to depend on each

other, and cannot easily substitute for each other in completing the group task. He qualifies this argument, however, stating that such methods are superior only in so far as there are incentives for students to learn from each other, and in subject areas that lend themselves to being broken down into sub-topics.

The specific cooperative learning method that was chosen for the purpose of the present study was Aronson's (1978) Jigsaw method. Originally designed to enhance the performance of minority students in newly integrated, Texas public schools, the Jigsaw cooperative learning method involves the division of learning tasks among various groups of students (McDougall & Gimple 1985). Each group member is assigned a section of academic material to learn, and subsequently teach to group mates. Members from each group who are assigned, or who choose, the same topic area, meet in "expert groups", where they discuss and learn about their specific topic areas. Once they have become "experts" on their respective topics, students return to their original groups, and take turns teaching their group mates what they have learned. The students are obliged to listen carefully to the explanations of their group mates, since they are responsible for learning all sections of the material, in order to perform well on an individual test. Students receive individual grades on their tests. In essence, then, the Jigsaw method does not employ a cooperative incentive structure. It does, however, make use of a cooperative task structure, and, as such, is classified as a cooperative learning method (Slavin, 1983).

Although mixed results have been reported for Jigsaw in terms of its effects on academic performance, self-esteem, and attitudes towards school (Moskowitz, et al., 1985), it was considered the most suitable cooperative learning method for use in the present study. Jigsaw was chosen primarily on the basis of its suitability for the type of narrative, factual information typically covered in social science courses such as the educational psychology course in

question (C210) (Morton-Bohlmeyer & Burke, 1987; Slavin, 1983). Secondly, the Jigsaw method was considered by the course instructors involved in the present study to be a relatively painless model by which their students, quite unused to cooperative group work, could adapt to the practice of working collaboratively with others. The relative simplicity of the model also made it an attractive option for the instructors themselves who, although well-versed in the theory of cooperative learning, had little experience in applying the technique to their university-level classroom teaching. Finally, the absence of a group reward structure in Jigsaw was considered attractive to the two instructors, who felt that the evaluation of student performance by way of individual, as opposed to group, grades, would render the whole learning experience less imposing, and less threatening for their students. Ironically, it is because of this very feature of Jigsaw, that the method has been criticized in the literature. Moskowitz, et al. (1985) have argued that the Jigsaw method is theoretically flawed, since it employs an individualistic reward structure instead of a cooperative one. Knowledge of this fact led the researcher to suggest to the instructors that a modified version of the Jigsaw method - one including a cooperative reward structure - be adopted in the present study. This suggestion was rejected by the instructors (for reasons explained above), and the original version of the Jigsaw method was implemented.

Student classroom participation. Lysakowski and Walberg (1982, p.560) define participation as, "The extent to which the student actively participates or engages in the learning process". In so far as this "active participation" takes place within the confines of the classroom, it may be considered to be classroom participation. Elsewhere referred to as "active learning" (Bouton & Garth, 1983; Brothen, 1986) or "student involvement" (Mallor, Near & Sorcenelli, 1981),

student classroom participation typically involves the use of small learning groups, and requires students to work together on tasks in order to learn a prescribed set of concepts or skills. As students use their own resources and each other to work through the content to be learned, a process of active discovery takes place (Brothen, 1986).

The theoretical framework for the notion of active participation in the learning process may be traced to a number of learning theorists: Behaviorists such as Guthrie, Thorndike and Skinner have emphasized active responding, claiming that people learn best by actively manipulating the learning material, responding to it, and relating one part to another (Bower & Hilgard, 1981). Developmental psychologists such as Dewey, and Piaget have also stressed the importance to learning of direct experience and the active manipulation of objects and ideas (Elkind, 1976). According to Piaget (1970), children learn best by doing, and it is therefore the responsibility of formal education to provide students with ample opportunities to actively participate in their own learning. Information processing theorists such as Lorayne and Lucas have also noted that verbal and physical activity tend to aid the encoding of information in long-term memory (Biehler & Snowman, 1986). Bloom is also among the theorists who have emphasized the importance of participation to learning. Bloom asserts that "the simple presentation of a set of cues to a passive learner is not likely to produce much in the way of learning" (quoted in Nordin, 1981, p. 158). More recently, Kolb (1984) has proposed a model of experiential learning in which he postulates the view that the personal involvement of the learner in a specific experience is essential for learning that is more "complete".

The hypothesis shared by all of the above theories is, quite simply, that students are more likely to learn content if they are actively engaged in it (Kraft, 1985). Much of the research evidence gathered to date supports this view. The

importance of participation to learning was first established under experimental conditions in 1917, when Gates observed that students who spent at least half of their study time actively talking about the material, remembered more than those who studied silently (Gates, 1917). A similar finding was reported by Hovland, Lumsdaine and Sheffield (1949) who found that requiring students to recite a phonetic alphabet out loud, instead of allowing them to passively review it, resulted in more efficient learning. In other verbal participation experiments of this type, adult learners have been observed to better remember information that they have had to connect actively in some way (Bobrow & Bower, 1969). Slamecka and Graf (1978) have noted, moreover, that students who actively generated their own explanations performed better than those who simply read explanations generated by others. Further, Michael and Maccoby (1961) found that the average achievement score of students viewing an instructional film rose from 51 to 66 %, when students were encouraged to practice the answers either orally or covertly. In addition to verbal participation, the importance of physical participation has also been substiantiated in the literature. A study by Kunihara and Asher (1965) demonstrated that anglophone students learned Japanese vocabulary at a faster rate when they acted out the words they were studying.

The literature suggests that student classroom participation may be effectively applied in a wide variety of learning situations. A recent meta-analysis carried out by Lysakowski and Walberg (1982) has shown the positive effects of participation to be constant from elementary through college instruction, and across socio-economic levels, races, private and public schools, and community types. It is not surprising then, that so many theorists, researchers and writers agree that the active involvement of the student in the learning process is critical (McKeachie, 1974; Smith, 1977).

In recent years, student classroom participation has come to be used with greater frequency in the education of college and university students. Attempts to remedy what Kraft (1985, p.149) has termed the "passivity and emotional flatness" of higher education have taken the form of enhanced student participation (Mallor, Near & Sorcinelli, 1981). In experiments involving student participation in college classrooms, the approach has consistently been found to yield positive achievement results (Lysakowski & Walberg, 1982). Smith (1977) has reported the high capacity of participation to effectively promote critical thinking among students in a small liberal arts college. Other benefits of implementing the approach at the college level have included increased enjoyment of courses, deeper understanding of course content, increased motivation to participate and learn (Brothen, 1986), as well as an increase in the professional competencies of students enrolled in medicine and business related courses (Michaelsen & Obenshain, 1983).

Bouton and Garth (1983) have stated that in order for student classroom participation to effectively influence learning, it must entail two major elements: firstly, an active learning process, promoted by student conversation in groups, and secondly instructor (faculty) expertise and guidance provided through structured learning tasks. It is not sufficient to simply increase discussion among students, nor to merely replace lectures with group work. Rather, both of these elements - structured tasks and interaction among peers - are necessary for learning to be effective (Bouton & Garth, 1983). Furthermore, it is essential that participation entail both involvement in, and practice of, the concepts being learned (Nordin, 1981). This means that implementation of the participation approach in the classroom must allow for both involvement in the task at hand, and sufficient practice time, for learning to occur. It should be noted that all of the above principles were adhered to in the application of student classroom participation in the current project.

Advance organizers. Ausubel (1960, p.267) has hypothesized that "the learning and retention of unfamiliar but meaningful verbal material can be facilitated by the advance introduction of relevant subsuming concepts (organizers)". The underlying rationale behind this hypothesis lies in early Gestalt psychology which postulates the view that a body of information is best learned if the learner understands how it is organized, and how its parts fit together and interrelate with one another (Bower & Hilgard, 1981). In Ausubel's initial (1960) study on advance organizers, the above hypothesis was supported. Ausubel found that college students more easily learned, and better retained, unfamiliar scientific information, presented in a 2 500-word description of the metallurgical properties of steel, when the description had been preceded by an advance organizer. The advance organizer employed in this study consisted of a 500-word passage which addressed some basic principles about alloys, without presenting any of the actual learning material (Ausubel, 1960).

In the 28 years following this discovery, numerous studies claiming to have tested Ausubelian organizers have appeared in the literature (Luiten, Ames & Ackerson, 1980). Many of these studies have reported positive effects for advance organizers on both learning and retention: In an early study by Ausubel and Youssef (1963), undergraduate students were presented with a 2 500-word passage on Buddhism. Before studying the passage, one group of students was provided with a 500-word "comparative organizer" which pointed out the major differences and similarities between Buddhism and Christianity. A second (control) group received a passage containing an historical introduction to Buddhism, with no organizing concepts. Significantly higher achievement test scores were obtained by the group that had received the comparative organizer, than by the control group. These results confirmed earlier findings reported by

Ausubel and Fitzgerald (1961) regarding the effect of advance organizers on the learning and retention of material concerning Buddhism. In a second study by Ausubel and Fitzgerald (1962), a passage of unfamiliar verbal information, dealing with specific hormonal changes in pubescence, was preceded by a brief passage containing general facts about uniformity and variability in sex characteristics. Here, once again, significantly higher learning and retention scores were recorded for the experimental group than for the control group. Further studies have shown too that advance organizers may improve learning and retention of material concerning the American Civil War (Fitzgerald & Ausubel, 1963), Social Studies (Allen, 1969), and abstract mathematical concepts (Scandura & Wells, 1967). In a study by Grotelueschen and Sjogren (1968) advance organizers containing principles that were closely related to subsequently presented material were found to be more effective in facilitating initial learning and transfer than were either familiar or unfamiliar concepts that did not contain such principles. More recently, advance organizers have been shown to exert a positive influence on the learning of compiler concepts by computer science and business administration students (Levine & Loerinc, 1985), and have been successfully used to improve knowledge application by medical students in computer-based clinical simulations (Krahn & Blanchaer, 1986). In addition, student test performance in a pre-clinical operative dentistry amalgam course has been significantly improved by the use of structured worksheets provided prior to the presentation of information to be learned (Green, 1986).

Despite these positive findings, several studies have refuted the instructional effectiveness of advance organizers (e.g., Barron, 1971; Bauman, Glass & Harrington, 1969; Feller, 1973). A meta-analysis conducted by Barnes and Clawson (1975), reviewed 32 studies on advance organizers, and compared

the number of studies that showed significant positive effects on learning and retention with those that showed either no significant effects or negative effects. Using this technique, Barnes and Clawson (1975) concluded that the benefit of advance organizers to learning and retention remained unproven. Lawton and Wanska (1977) have criticized the Barnes and Clawson study, however, pointing out several inaccuracies in the latter's description and interpretation of an advance organizer, as well as inconsistencies in the classification of the reviewed studies.

Further criticism of the Barnes and Clawson study has been forwarded by a more recent meta-analysis (Luiten et al., 1980). According to Luiten et al. (1980), the "voting technique" of analysis, employed by Barnes and Clawson, is biased against finding a favourable outcome, since it groups studies showing positive, yet statistically nonsignificant effects with studies showing negative effects (both significant and nonsignificant). In response to the Barnes and Clawson study, Luiten et al. (1980) examined 135 published and unpublished studies on the facilitative effect of advance organizers on learning and retention. Using the standardized "effect size" statistic described earlier, they were able to refute the Barnes and Clawson findings, and to establish firmly the effectiveness of advance organizers as an instructional strategy. Luiten et al. (1980) found the mean effect size exerted by advance organizers on learning to be .21 sigma, and noted that the positive influence of the strategy on retention tended to increase with time. Also noted was the capacity of advance organizers to positively affect both learning and retention across all grade levels and subject areas. Subtle differences in these positive effects were found between studies assessing learning, and those assessing retention. Advance organizers were found to be especially effective in learning studies involving college and special education students, whereas their effect on retention was at a maximum in studies involving

primary school students. With regard to subject area, the largest average effect size detected for learning studies was in the social sciences, while for retention studies, advance organizers appeared to be particularly beneficial in the physical sciences. Luiten et al. (1980) have also shown that advance organizers tend to be more beneficial for high ability than for low ability learners, and that they are most effective in an aural mode, as opposed to being written.

Much of the confusion regarding the effectiveness of advance organizers has centered around two main issues: appropriate use, and accurate definition. The literature suggests that advance organizers are most effective for teaching content that has a well organized structure that may not be automatically apparent to students. They are less effective, however, with factual information that does not lend itself to clear organization, or in subjects consisting of a large number of separate topics (Ausubel, 1978; Barnes & Clawson, 1975). Hence, any studies which have made use of advance organizers for the latter type of subject matter, will have observed less favourable outcomes for the instructional strategy. It should be noted that in the case of the present study, the subject matter covered by the instructional unit had a well organized structure, and consisted of a small number of interrelated topics. As such, advance organizers were considered to be an appropriate instructional device for use in the current project.

The second, and more serious issue surrounding the question of advance organizer effectiveness concerns the way in which organizers have been defined (Ausubel, 1978). As noted earlier, Barnes and Clawson (1975) have been criticized for inaccuracies in their description and interpretation of advance organizers (Lawton & Wanska, 1977). It has been suggested in the literature that many of the studies which have not found positive effects for advance organizers have failed to do so merely because the devices that they have employed do not

match Ausubel's specification of what constitutes an advance organizer (Ausubel, 1978). Ausubel (1978, p.251) has defined advance organizer as, "introductory material, presented at a much higher level of generality, abstraction, and inclusiveness than the material to be learned". He draws a distinction between an advance organizer and an overview, which he defines as:

> a summary presentation of the principal ideas in a passage that is not necessarily written at a higher level of generality, abstraction, and inclusiveness, but achieves its effect largely by the simple omission of specific detail (1978, p.251).

Ausubel (1978) also stipulates that in order for an advance organizer to function successfully, it is essential that it is related to prior learning, and stated in familiar terms. In this way, advance organizers function as a bridging device between what the learner already knows, and what he/she is expected to learn, and thus provide a framework for anchoring new learning.

Several researchers and educators have experienced considerable difficulties in adhering to Ausubel's basic definition of an advance organizer (Levine & Loerinc, 1985). It is not clear, for example, how general the organizer should be in order to ensure that it actually relates to the new material. It is also not clear how abstract organizers should be in order to allow the learner to make the connection between the organizer and the new material (Levine & Loerinc, 1985). It is uncertainties such as these which render the construction of true Ausubelian advance organizers extremely difficult. In the present study, the advance organizers employed may be defined as falling somewhere between true Ausubelian advance organizers, and conceptual organizers. All of the employed organizers were constructed so that they linked new material with that which was already known by the students. In addition, the shorter advance organizers consisted of information presented at a higher level of generality, abstraction, and inclusiveness than the material to be learned. The longer

organizers, on the other hand, were more specific, and were explicitly designed to include the concepts to be learned. As such, the longer advance organizers may be said to have resembled overviews, or chapter outlines, since each essentially consisted of an outline of the material to be learned. It should be noted, however, that such explicitly concept-directed organizers have been found in the literature to be instructionally effective (Levine & Loerinc, 1985). Finally, it should be noted that the advance organizers employed in the present study were presented to the students in either an aural or written mode, with many being provided in both forms simultaneously.

Rationale for Combining the Above Strategies

As explained in the introductory chapter of this thesis, the project in question began as a simple instructional design venture, intended, from the outset, to incorporate principles of cooperative learning. The cooperative learning instructional strategy was initially chosen because it was considered to be an appropriate method for promoting the attainment of the cooperative interaction skills addressed in the unit. As already mentioned, the particular cooperative learning method that was selected for this purpose was Aronson's (1978) Jigsaw approach. It was owing to the specific nature of the Jigsaw method (which necessitates increased student participation and involvement with the material to be learned), and the insistence of the two course instructors that all of the planned cooperative group work should be implemented within class time, that a second instructional strategy suggested itself for use in the unit. This strategy is what Bloom (1984) has termed "student classroom participation". Also termed "active learning" or "student involvement", this strategy of increased student participation and involvement in lessons is suggested in much of the literature concerning cooperative learning in higher education (e.g., Gnagey, 1962; McClintock & Sonquist, 1976).

Inherent in the type of cooperative learning method that makes use of enhanced student classroom participation, is the instructor's relinquishment of a considerable proportion of classroom control. In this environment, the responsibility for communicating course content is turned over to readings and student activity. This abrupt change in the instructional status quo may be construed as a threat by both teacher and student alike, since it challenges the traditional notion of the course instructor as the primary source of information, and increases the possibility of student miscomprehension (Charlesworth, 1986). Field applications of this cooperative/participative approach stress, therefore, the importance of explaining to students, clearly and explicitly, the objectives, goal structure, and criteria for success for each task or learning activity (e.g., Cox, 1984; Smith, 1986). In the present study, both the instructors and researcher felt that, in addition to providing the students with the above information, it would be expedient to render them with advance, overall descriptions of the course content to be covered. In this way, it was hoped, the students would be made aware of the overriding themes which encompassed the otherwise fragmented individual and group topic areas that they chose, or were assigned. It was thus that Ausubelian-type advance organizers came to be the third instructional strategy employed in the designed instructional unit.

Special care was taken to ensure that the three chosen instructional strategies would be complimentary. The intention was to combine the strategies in such a way that their separate effects on student learning would be additive. In order to heighten the probability of realizing this outcome, the guide lines for variable combination suggested by Bloom (1984) were consulted, and his "rule" of choosing instructional strategies involving different objects of the change process was adopted. By referring to Bloom's classification of the strategies in terms of the direct object of the change process influenced by each (1984, p.6), it

was determined that cooperative learning, student classroom participation and advance organizers do theoretically affect different change objects. As such (according to Bloom's rationale), these three variables were considered suitable for combination together, and could be expected to yield a cumulative effect size, approximating two sigma. Hence it was that the decision to combine the three above instructional strategies was finalized. It was determined that, in order to accurately assess the relative benefits to student learning of the combined instructional strategies, it would be necessary to involve a control group in the investigation. It was for this purpose that a third group of educational psychology C210 students was included in the present study.

Additional Concerns of the Project

Apart from investigating the two sigma challenge, the present study was concerned with a number of additional issues, all of which were quite unrelated to the notion of combining instructional strategies. First of all, the researcher and instructors were interested in uncovering the extent to which exposure to the designed instructional unit would influence students' attitudes towards cooperative group work. We were also intent on guaging whether, and to what extent, students' capabilities to interact cooperatively with one another would be improved by their experiences in small group work over the course of the instructional period. Of equal concern was whether the designed instructional unit would encourage increased social interaction among class members. Finally, since the present project involved the design of an instructional unit by way of principles of instructional systems technology, and did not merely utilize a prescribed treatment condition, it was essential that procedures be established to formatively evaluate the unit. In this way, any problems in the designed instructional unit could be identified and appropriately modified.

Statement of Research Problem and Hypotheses

The purpose of the present study was firstly to design, and secondly to assess the cognitive, affective, and sociometric outcomes of, a unit of group instruction, developed by way of instructional systems design, and incorporating three instructional strategies: cooperative learning, enhanced student classroom participation, and advance organizers. The extent to which this theoretically "maximal" method of group instruction approximated the instructional effectiveness of one-to-one tutoring (namely, two sigmas above standard group instruction) was investigated. To this end, the present study sought to determine whether undergraduate students, exposed to the systematically designed instructional unit would attain significantly different cognitive achievement scores than those attained by undergraduate students exposed to conventional group instruction (primarily lecture-based). Furthermore, the present study aimed to detect whether those students exposed to the designed instructional unit would display a change in attitude towards cooperative group work, and in their ability to interact cooperatively. Also investigated was whether any shifts in social interaction among class members would result as a consequence of their exposure to the treatment condition. Finally, several formative evaluation procedures were mobilized, so as to detect any problems which existed in the materials, activities, and strategies included in the instructional unit.

It was hypothesized that those students exposed to the designed instructional unit would attain higher cognitive achievement scores than their counterparts exposed to conventional group instruction. It was further hypothesized that the three strategies employed in the instructional unit would be cumulative, such that the scores of the exposed students on a cognitive post-test would exceed, by a quantity approximating two sigma, the scores of those students not exposed to the unit. Moreover, it was expected that students

exposed to the instructional unit would display more positive attitudes towards cooperative group work than they had exhibited before exposure, and that these modified attitudes would exceed, in a positive direction, those of the control group. In addition, it was anticipated that students exposed to the designed instructional unit would exhibit significant gains in their ability to interact cooperatively, and that post-treatment measurements of their cooperative abilities would exceed those of students exposed to conventional instruction. Finally, it was hypothesized that social interaction among class members in the treatment condition would increase as a result of exposure to the instructional unit.

CHAPTER 3

Method

Subjects

The sample was drawn from three sections of an undergraduate educational psychology course, offered at Concordia University in Montreal, and consisted of 133, predominantly female and anglophone students, with a modal age of 19 years old.

Materials

A systematically designed instructional unit, incorporating cooperative learning, enhanced student classroom participation, and advance organizers constituted the instruction for the treatment condition. The unit was developed by the researcher, according to principles of Instructional Systems Design, and addressed the content normally covered during the first five weeks of the winter semester (namely, Learning Theories) by the educational psychology course in question. The unit consisted of a total of twelve and a half hours of instruction, and was delivered, over a period of five weeks, to the treatment groups. A series of lectures, covering the same content, and based on the same instructional analysis as the treatment condition, was developed by one of the course instructors of the educational psychology course. Constituting a total of twelve and a half hours of instruction, and delivered over a period of five weeks, these lectures provided the instruction for the control condition. In both the treatment and control conditions, instruction was carried out by the regular course instructors.

Several instruments were developed to measure the cognitive, affective, and sociometric outcomes of the implemented instructional unit. (Note: Samples

of these and all other instruments described in this section are included in Appendix A)

Cognitive Measures

Cognitive Achievement. Subjects' cognitive knowledge of the content covered by the instructional unit was measured by way of a pre-test and post-test, administered to both the treatment and control groups. The cognitive pre-test consisted of short-answer, criterion-referenced questions. Designed by the researcher, the pre-test assessed the cognitive terminal performance objective, and several key subordinate objectives of the instructional unit. The cognitive post-test consisted of a mix of short-answer and multiple choice questions. Designed by the regular instructors of the educational psychology course, the post-test assessed student knowledge of subject matter both addressed and unaddressed by the instructional unit. It should be noted that only those items addressed by the instructional unit were considered for analysis by the researcher. Hence, for the purpose of analysis, students' cognitive achievement was assessed by way of 38 multiple-choice items, contained in the cognitive post-test.

It should be noted that mastery of each of the objectives included in the instructional unit was also tested by way of criterion-referenced test items **embedded** in each lesson. While no separate instrument containing all of the embedded test items was created, those items pertinent to each lesson were included in the numerous Product Sheets employed in the instructional unit (see Appendix C).

Prior achievement. A prior achievement score was calculated for each student. This score was derived by adding together all grades received by each student in the course of the first semester, for work accomplished in C210.

Hence, each student's prior achievement score was based on his or her cumulative performance on two exams and one paper. The calculated prior achievement scores were expressed in the form of percentages.

Affective Measures

Attitudes towards cooperative group work. A paper-pencil instrument assessing subjects' attitudes towards cooperative group work was administered to the treatment and control groups both prior to and following the five-week instructional period. Of the 18 agree/disagree statements contained in the instrument, 16 were used to assess students' attitudes towards cooperative group work (see Section A, questions 1-3, 5-11, and 13-18 of "Pretest 1" and "Postquest" in Appendix A). The body of cooperative statements included in the instrument were chosen on the basis of the extent to which they assessed commonly-held notions regarding cooperative learning, small group work, and cooperation in general. The attempt was not to create an instrument of homogeneous items, but rather, one containing items representative of a wide range of issues related to cooperation. The created instrument was first pilot tested, and modified, before it was presented in its current form to the target group.

Cooperative group skills. In addition to the cooperative learning-based questions contained in the pre and post attitude questionnaires, the students were also required in both tests to rate their ability on 13 cooperative group/ interaction skills. The 13 skills included in this questionnaire were derived from the literature on cooperative learning, and by way of interviews with the cooperative learning expert involved in the present study. The chosen 13 skills were the very same skills which constituted the criteria for the cooperative group

interaction objectives contained in the instructional unit. It was clear to the researcher that if these were the cooperative skills which the unit aimed to teach, and on which the students would be encouraged to focus, they naturally constituted the items that should be included in any test of cooperative ability administered to the students. Given that these skills encompassed the main affective goal of the unit, it was decided that they should be analyzed as a homogeneous set, just as the items included in the cognitive pre and post-test instruments (encompassing the cognitive goals on the unit) were to be treated as a single body of items.

It should be noted that a more objective method of assessing students' cooperative group skills was first sought, before the above-noted technique was chosen. Perhaps the most objective and reliable way of assessing the students would have been to employ trained observers to sit in on the lessons, and to record students' cooperative behaviour, according to some pre-determined observation technique. Unfortunately, the instructors in the present study would not allow this, since they felt that the presence of observers in the classroom would be distracting for both the students and themselves. Hence, since there were no facilities available to render the observers less obtrusive (and, thereby, less threatening), the idea of placing trained observers in the classroom had to be abandoned. A similar suggestion, proposing that the instructional sessions be video-taped, was also rejected on the same grounds. An alternative proposal for assessing students' cooperative group skills involved having the instructors themselves observe their students. While this idea might have been considered feasible with smaller classes, the large classes used in the present study meant that there was simply not enough time for the instructors to observe all of their students with any degree of accuracy. Hence, this idea was also abandoned, and the self-assessment method described above adopted in its stead.

Sociometric Measures

Changes in social interaction among class members were assessed by way of a paper-pencil sociometric test, administered to the treatment groups only, both before and after exposure to the instructional unit. The test was designed according to established sociometric principles, as defined by Northway (1967), and was used to determine the degree to which subjects in the two treatment groups were accepted by their groups. The sociometric instrument consisted of four questions which asked subjects to state with whom among the members of their class they preferred to associate for specific activities, and in particular situations. Since the first and fourth questions addressed the same basic issue, only one of them (question 4) was included in the calculation of sociometric scores. A fifth question asked subjects to name any students with whom they had been acquainted before the commencement of the educational psychology course. This question was used merely to investigate the extent to which subjects' choices in other questions depended on previously established relationships. As such, it too was excluded from the calculation of sociometric scores. Based on the subjects' responses, two sociometric scores were calculated: A "social acceptance score", otherwise referred to as "choice status" or "sociometric status", and an "emotional expansion score". The former is based on the number of choices received by each individual on each criterion, while the latter represents the number of people chosen by each individual.

Formative Evaluation Instruments

In addition to the instruments that measured the cognitive, affective and sociometric outcomes of the unit, a number of other instruments were developed to evaluate the pedagogical merits and demerits of the instructional unit. As with the cognitive and affective instruments, the instruments developed for the

purpose of formative evaluation were predominantly paper-pencil in nature. They included:

a. A lesson evaluation questionnaire, filled out on a weekly basis, by all subjects in the treatment condition. This instrument served to detect subject reactions to each individual lesson, and to pinpoint any specific problems experienced with the materials and/or activities employed therein.

b. A lesson evaluation questionnaire, filled out by the instructor of one of the treatment groups, for each lesson contained in the instructional unit. This instrument allowed the instructor to record students' reactions to each and every learning activity contained in each and every lesson. In this way, specific weaknesses in each lesson could be accurately located, and accordingly revised.

c. A final evaluation questionnaire, administered to all subjects in the treatment condition, at the end of the five week instructional period. This instrument required students to indicate their overall opinion regarding the educational effectiveness of the instructional unit as a whole, and their preference or non-preference for the cooperative/participative approach employed, as compared with a traditional, lecture-based approach. A similar, but appropriately modified instrument was delivered to the control group, on conclusion of the five week instructional period.

d. A group processes evaluation questionnaire. A paper-pencil instrument was developed to evaluate group processes in the classroom on a weekly basis. Completed by the students themselves, this instrument provided both the researcher and the instructors with a clear picture of the cooperative interaction and bonding processes that took place among group members, during each lesson.

The above represent all of the formal instruments developed for the process of formative evaluation. It should be noted, however, that a number of non apparatus-dependent procedures were employed in the formative evaluation of the instructional unit. These procedures will be described in further detail in the following section of this chapter.

Procedure

The procedure for the present study consisted of two parts: a design phase, and an implementation/evaluation phase. A detailed description of each phase is provided below:

The Design of the Instructional Unit

The instructional unit described in this paper was designed according to principles of Instructional Systems Design (ISD). The model of ISD employed was a modified version of the Dick and Carey Systems Approach Model for Designing Instruction (Dick & Carey, 1985). Modifications to the Dick and Carey model were slight, and were carried out only where the original model did not fulfil the requirements of the design task. What was involved was simply the inclusion of two additional steps into the Dick and Carey model. These were:

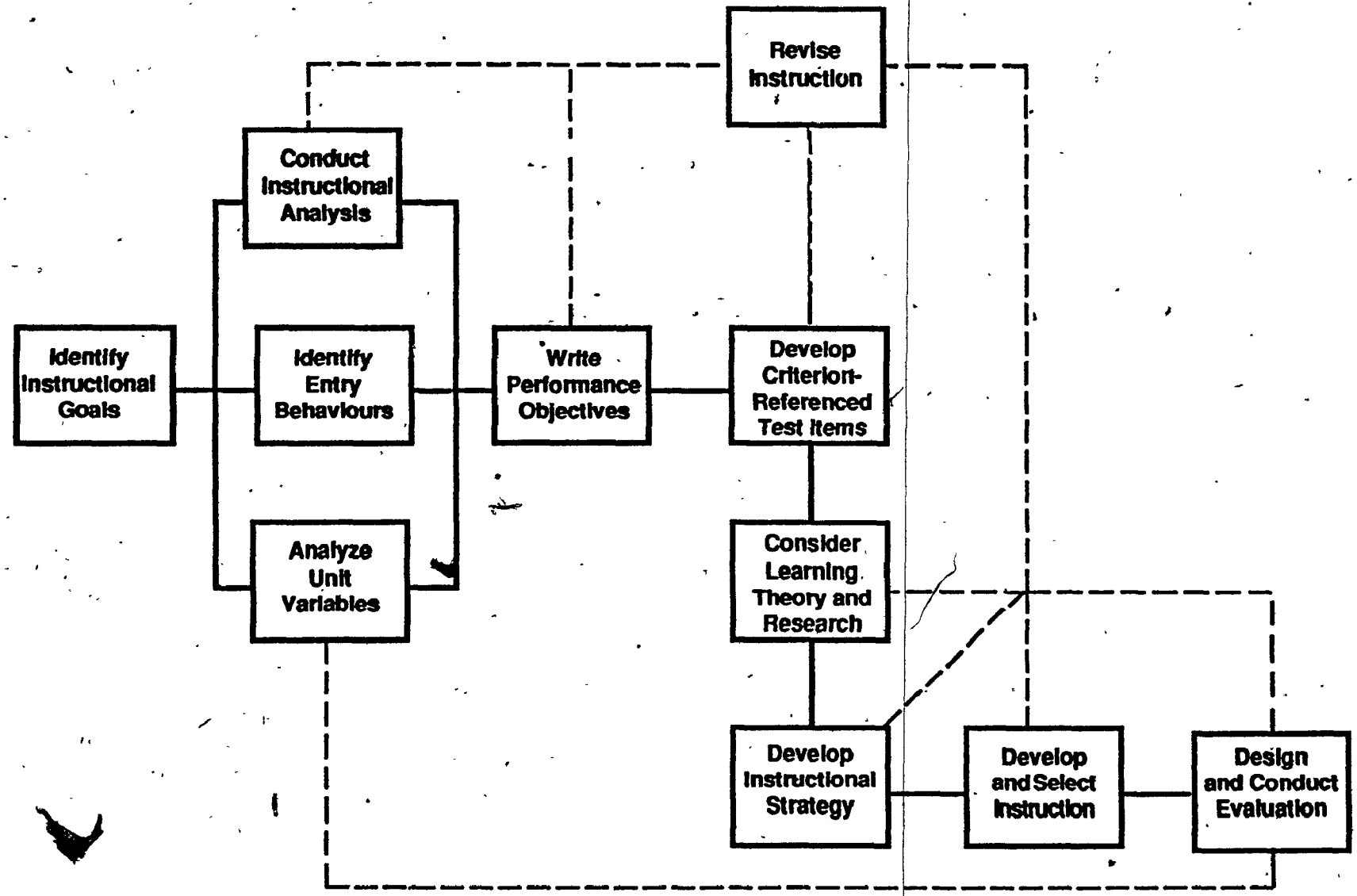
1. an analysis of the unit variables, and
2. a consideration of research and theories regarding learning

The modified instructional design process is illustrated in Figure 1. An in-depth description of each step in the instructional design process follows.

1. Identify the instructional goals. In order to identify the overall, general goals of the instructional unit, a needs assessment was carried out. The needs assessment consisted of two parts; one appraising the needs as identified by the instructors, and the other investigating whether these needs were indeed felt and recognized by the students. The assessment of the needs as identified by the instructors was carried out by way of in-depth, one-to-one interviews with the two course instructors whose students were to serve as the target audience for the unit. Through these interviews, the overall objectives and concerns of the

Figure 1: The Instructional Design Process

(adapted from Dick & Carey, 1985)



instructors were made evident. The main concern indicated by the instructors was that their students were not learning in this, nor in any other undergraduate education course, the cooperative skills that they would need upon entering the work force. They were also dissatisfied with the level of teacher-student and student-student interaction, operating in C210 classrooms as a consequence of high enrolment in the course. They were anxious to find some way of modifying the course structure which would remedy this situation.

In order to assess the students' needs, a number of statements regarding the two main concerns of the proposed instructional unit (namely, learning theories and cooperative skills) were embedded in the attitude pre-test described earlier. Moreover, the students were requested to rate, on this questionnaire, their present and desired knowledge of the three learning theories to be covered in the proposed instructional unit, and also their present and desired abilities in 13 cooperative skills. In this way, gaps between the existing and desired status quo were identified. A copy of the attitude questionnaire (entitled Pre-test 1) has been included in Appendix A. The items relevant to the needs assessment are statements 4, 5, 12 and 13 in Section A, all of Section B, and questions 6 and 7 in Section C.

Of the 106 respondents to the attitude pretest, 97 agreed that it is important for students to know how to cooperate with others in their work, and 99 felt that working with others should be taught in schools and universities. In so far as the notion of studying learning theories was concerned, 101 of the 106 respondents acknowledged the value of studying various psychological theories of learning, while all but two students agreed that it is important for teachers to understand how children learn.

Table 2 summarizes the gaps in the students' present and desired knowledge of learning theories and cooperative skills, as identified by the students themselves on the pre-test. From this, we see clearly that the majority

Table 2: Gaps in Students' Present and Desired Knowledge and Skills

	Number of students (N = 106)			
	Gap	No Gap	Negative Gap	No Response
Learning Theory				
Cognitive Theories	101	3	0	2
Humanism	100	4	1	1
Information Processing	94	5	5	2
Cooperative Skill				
Listening to others	66	32	4	4
Sharing ideas in a group	83	22	1	0
Asking probing questions	94	11	0	1
Offering helpful & unoffensive criticism	86	15	4	1
Participating in a group	76	27	1	2
Encouraging idea-sharing	84	21	0	1
Compromising	69	27	8	2
Providing support	64	38	0	4
Offering praise	65	37	0	4
Cooperating	60	40	2	4
Helping others	62	40	2	2
Accepting others' ideas	66	35	3	2
Displaying positive feelings	71	32	3	2

of the students surveyed felt dissatisfied with their current knowledge of the three learning theories in question, as well as with their cooperative skills. Finally, in response to questions which called for the students to identify situations outside of C210 in which they might need to know learning theories, or to work cooperatively with others, the students pinpointed the following referent situations:

learning theories:	child rearing; teaching and other professions (social work, community work); counseling; parenting; graduate work in education; self-assessment
cooperative group work:	teaching and other professions; volunteer work in community organizations; problem-solving; meetings; apartment sharing; home/family situations; other courses

The students' identification of gaps between the existing and desired status quos, and of various referent situations outside of C210 in which learning theories and cooperative group work could be used, substantiated the need to teach these areas.

As a result of the needs assessment, the following general goals for the instructional unit were identified:

At the end of the instructional unit, the students will:

a. demonstrate a thorough knowledge of the material covered in the three areas studied (i.e., Cognitive and Humanistic learning theories, and Information Processing)

b. demonstrate a knowledge of how the theories studied may be applied to classroom teaching

c. demonstrate the social skills necessary to collaborate with a group of students in facilitating the learning of material

2. Conduct an instructional analysis. Having identified the general goals of the unit, the researcher determined what type of learning would be required of the students in order to reach these goals. The instructional goals named above were identified as falling into the following learning domains:

Goal #1 - verbal information.

Goal #2 - verbal information and intellectual skills

Goal #3 - attitudes

Once the learning domains for each goal were identified, an in- depth analysis of the subordinate content and skills contained within each goal was carried out. In this way, the precise skills that the students would have to perform or know, in order to attain these goals, were determined. This procedure involved the researcher in:

a. examining the precise factual information that was to be included under the heading of the three learning theories;

b. identifying the teaching applications suggested by the numerous sub-theories contained therein; and

c. discerning the specific group and social interaction skills that characterize cooperative behaviour.

The skills and information identified in the instructional analysis formed the basis for the behavioral objectives that would be included in the unit.

3. Identify entry behaviours and characteristics. Building on the subordinate skills and knowledge identified in the instructional analysis, a number of entry behaviours were identified. According to Dick and Carey (1985), the entry behaviours should consist of all the specific skills that students must have, prior to beginning instruction. In the case of the present instructional unit, apart

from the possession of university-level literacy skills, there were only three entry behaviours that were deemed prerequisite. These included the ability to:

a. describe the main principles of the behavioral learning theorists;

b. explain age level characteristics of children aged 3 to 12, and adolescents aged 13 to 18; and

c. explain Piaget's theory of stages of cognitive development.

The first of these behaviours was considered necessary, since the students would be required, several times in the course of the instructional unit, to compare the characteristics of the cognitive and humanistic learning theories with those of the behaviorists. As for the remaining two entry behaviours, the knowledge subsumed in each would be needed by the students when it came time for them to apply learning theories to classroom teaching, such that their applications would be appropriate to the characteristics of the learners in question.

In addition to the entry behaviours, the characteristics of the learners were identified at this point. This was accomplished through interviews with the instructors, in-class observations of the learners, and, to a lesser extent, by way of the personal information supplied by the students on the aforementioned attitude questionnaire. In this way, the age, interests, educational backgrounds, career aspirations, prior experience with small group work, and in-class behaviour of the students were assessed.

4. Analyze unit variables. At the same time as the learner characteristics were being identified, an analysis of all variables connected with the instructional unit was carried out. This step, omitted in the Dick and Carey model, proved to be invaluable in the case of the present instructional design process. Since the

instructional unit in question represents only one quarter part of a full-year course - a course already in progress at the time of design - there were a number of norms and practices already in place that would greatly influence decisions and choices made for the unit. Some of these practices would prove to be all but totally inflexible, and would necessitate accommodation into the instructional unit, and sometimes even considerable compromise. The issue of course requirements serves as an illustrative example of this fact.

The students in C210 had been informed at the beginning of the fall semester about the nature and number of assignments that they would be expected to complete, in order to fulfil the course requirements. They had also been informed of the number of quizes and exams contained in the course, and whether these would be open-book, short-answer, essay, or multiple-choice in nature. Due dates for all assignments had been pre-set, and a percentage of the total course grade had been attached to each. Once stipulated, none of these course requirements could be modified in any way. What this meant, in terms of the instructional unit, was that the assignments it contained had to fit into this already established system of evaluation. For example, since none had been scheduled to coincide with the instructional unit, I could not test the attainment of objectives by way of a take-home essay, even if the logic of the instructional design suggested that I should. Nor, for that matter, could I change the nature of the post-test, to be administered at the end of the instructional unit, from a multiple-choice test to one composed of essay questions, despite the fact that the latter would provide a more accurate testing of the objectives. It was precisely this type of "given" factor that was identified during the analysis of the unit variables.

The procedure for analyzing the unit variables was adopted from the method advocated by Coldeway and Coldeway (1987). The variables analyzed can be broken down into the following categories:

a. instructional environment - time available for instruction each week, classroom space and set-up, grading policies, course organization and requirements, test formats, availability and role of teaching assistant

b. instructor's attributes - teaching style, experience with cooperative learning, experience in teaching subject matter, interaction with students

c. instructional materials - text book(s), supplementary readings, availability of various media

d. budget - for equipment and supplies

As with the identification of the learner characteristics, the analysis of the unit variables was based on various interviews with the instructors, and in-class observations of the students. In-class observations of the instructors provided another source of information for the analysis.

The variable analysis phase of the instructional design process provided the researcher with a clear and essential understanding of all the factors that might influence the unit. In the subsequent design of the unit, these factors were taken into consideration. The variable analysis phase also involved the researcher in conferring with supervisors, colleagues and experts, in an attempt to uncover any hidden factors which might have an important effect on the instructional unit, and to find solutions to any constraints that the variables embodied. Undoubtedly, the usefulness of this step in the present study was due, to a great extent, to the particular nature of the instructional unit in question, which was, and is, inextricably linked with the larger educational psychology course to which it belongs. Nevertheless, it is felt that this step would be useful in any process of instructional design, where outer constraints such as budget limitations, policies, and the instructional environment exert influences on the choices of the instructional designer.

5. Write performance objectives. The next step was to write performance objectives. Two terminal performance objectives (TPOs) were identified. The first subsumed the two cognitive goals of the unit regarding learning theories, while the second embodied the affective goal of cooperative interaction. Based on the instructional analysis and the statement of entry behaviours, a number of subskills were identified. These subskills comprised all the skills deemed necessary for the students to possess in order to achieve the two terminal performance objectives. For each subskill, a matching performance objective was derived. Contained in each matching performance objective is a statement of the skills to be performed, who will perform them, the conditions under which they must be performed, and the criteria for successful performance.

A learning domain and domain level were assigned to each performance objective, and the objectives were then placed in two learning hierarchies (one for each TPO), according to prerequisiteness. The objectives, their respective learning domains, and the two hierarchies appear in Appendix B. In general, the objectives concerning learning theories follow a pattern of: theory definition -> theory comprehension -> applied theory identification (i.e., recognition of the theory as it is applied in classroom instruction) -> theory application. As for the objectives concerned with the acquisition of cooperative skills, on a cognitive level these follow a pattern of: concept definition -> concept identification (i.e., recognition of examples from non-examples) -> concept production, while on an affective level they progress along Krathwohl's Affective continuum from valuing -> organization -> characterization.

It should be noted that in terms of the learning theory objectives, the hierarchy is "bottom heavy". This is due to the large number of objectives which

correspond to Bloom's knowledge and comprehension levels, and the paucity of higher level objectives. Often, such a dearth of higher level objectives in an instructional unit is held in disdain by instructional designers. Indeed, in the present case, an attempt was made to introduce a greater number of higher level objectives into the unit. However, this proved to be an impractical objective, owing to the premium placed by the instructors and the course structure on the acquisition of baseline, verbal information regarding learning theories and their use in classroom teaching, as well as the limited time available for covering this substantial amount of information. It was, therefore, not feasible to incorporate into the five weeks of instruction any additional objectives. Hence, as it stands, the cognitive hierarchy consists almost exclusively of comprehension level objectives, albeit that they are at different sub-levels of comprehension.

The designated performance objectives, having been placed in a learning hierarchy, were then clustered into teachable chunks, i.e., lessons.

6. Develop criterion-referenced test items. The next step was to develop assessment items, based on the performance objectives. The criterion-referenced test items developed for the present instructional unit were based upon, and parallel to, the behaviours and skills described in each performance objective. Special care was taken to match the criteria for successful performance, contained in the assessment items, with the criteria for successful performance required by the objectives. Ideally, the criterion-referenced test items should be used to assess student performance in the pre-test, post-test and embedded tests contained in an instructional unit. In the present case, however, the criterion-referenced test items developed by the designer were only used in the pre-test and embedded tests. As mentioned earlier, the post-test was designed by the course instructors, and was, therefore, beyond the

jurisdiction of the designer. The designer did attempt, nevertheless, to make suggestions regarding the appropriateness of the post-test items, and, as far as possible, to influence the inclusion therein of test items that were criterion-referenced. Unfortunately, this attempt was not very successful, and in the end, the items included in the post-test, while corresponding to the content addressed by the instructional objectives, were not criterion-referenced (c.f., Appendix A).

7. Consider learning theory and research. Although not treated as a separate step by Dick and Carey (1985), the process of considering learning research, in order to develop a sound instructional strategy, is implicit in their model of ISD. Dick and Carey suggest that the instructional strategy should be "based upon current outcomes of learning research, current knowledge of the learning process..." (1985, p.6). The importance of consulting the literature and considering current theories regarding learning, cannot be overstated. It is felt that even the best instructional analyses, and most clearly thought-out behavioral objectives would have little impact on their target audiences, if the instructional strategy employed were not based on sound pedagogical theory and practice. The literature is replete with experiments on the effectiveness of numerous instructional strategies; these must be considered, as must the literature regarding learning theories.

It is the opinion of the researcher that the development of an effective instructional strategy is much more than the simple adherence to a logically sequenced progression of instructional events that is commonly adopted by instructional designers. Gagne and Briggs' (1979) nine events of instruction serve as a case in point. These events, while important, do not guarantee that learning will occur, since they do not subsume essential pedagogical factors, such as meaningfulness and relevance, interest and motivation. Mitchell (1980)

has argued, for example, that interest, a deviation amplifying feedback process, is all too often neglected by instructional designers. It is only by consulting the literature (or, equally, a pedagogical expert) that the instructional designer can attend to these issues, and thereby select the teaching methods, learning activities and media that are best suited to the instructional task at hand. For this reason, the researcher chose to designate as a separate step this process.

It was during this stage of the instructional design process, that the notion of combining instructional strategies first suggested itself. Moreover, as ideas about an overall instructional strategy began to emerge, the literature provided direction regarding the merits and demerits, as well as the strengths and flaws of the particular methods and procedures being considered for inclusion in the unit.

8. Develop an instructional strategy. Based on the consideration of learning theories and research, an instructional strategy was developed. Dick & Carey (1985, p.136) define instructional strategy as that which "describes the general components of a set of instructional materials and the procedures that should be used with those materials to elicit particular learning outcomes from students". In order to develop an effective instructional strategy, one must first carry out the instructional analysis, and derive the goals, objectives and test items to be used in the instructional unit. The design of the present instructional unit was somewhat unusual, however, in that a particular instructional strategy (namely, cooperative learning) had been pre-selected by the course instructors, long before an instructional analysis was carried out. What had not been pre-determined, however, was the appropriateness and feasibility of employing the desired instructional strategy for the content to be taught, and the learners in question. Moreover, there are many different methods that make up cooperative learning, and a decision had to be taken as to which method would be the most

suitable for the learning situation in question. After considering the literature on cooperative learning, as well as the goals, content and learner characteristics inherent in the instructional situation, it was decided that cooperative learning was indeed an appropriate strategy for the instructional unit. It was furthermore decided that Aronson's (1978) Jigsaw strategy would be the most appropriate cooperative learning method to use. For reasons described earlier in this paper, two additional instructional strategies (namely, enhanced student classroom participation and advance organizers) were also included in the unit. Thus, in its final form, the instructional strategy developed for the unit was, in fact, a combination of three separate instructional strategies. The pedagogical soundness of combining instructional strategies in this way is substantiated by the work of Bloom (1984), Leyton (1983) and Tenenbaum (1982).

9. Develop and select instruction. Having decided on an instructional strategy, the next step was to develop the activities and materials that would constitute the lessons for the instructional unit. An instructor's guide, containing detailed lesson plans, and a large number of original learning materials were developed. In addition, appropriate readings were chosen for in-class use by the students. Contained in the instructor's guide were in-depth descriptions of the presentation, practice, and evaluation procedures designated for each objective cluster. Special care taken to ensure that these procedures were in keeping with the overall goals of the instructional unit.

The teaching and learning activities incorporated in each lesson, embodied the three chosen instructional strategies described earlier in this paper. While certain differences exist in each, a general pattern governs the five lessons which make up the instructional unit. These may be listed as follows:

1. Attention grabbers - Every lesson began with some sort of attention-gaining activity. These were teacher-directed (i.e., administered by the instructor) and served to capture the interest of the students.

2. Advance organizers - At the beginning of each lesson, the instructor would provide an advance organizer of the material to be covered in the lesson. Recall of previously learned information, relevant to the lesson in question, would be stimulated at this point. Advance organizers were also provided to the students during group-directed activities. These took the form of guide sheets which were rendered to the expert groups.

3. Cooperative group work - The major portion of time spent in class was devoted to learning activities involving cooperative group work. As explained earlier, Aronson's (1978) Jigsaw method was employed for this purpose. Students performed both learning and teaching activities in a small group structure. Specially developed "Group Task Sheets" and "Group Product Sheets" were employed during group work. The purpose of the Group Task Sheets was to instruct the students about the specific tasks that they were expected to complete in the course of each group session. The task sheets comprised a body of criterion referenced test items regarding each area of study. Having taught each other all that they knew about each area; the students were expected to answer these test items. The students were instructed to record their responses on the Group Product Sheets provided. These were blank sheets of paper which each group member was required to sign, on completion of each task.

4. Attainment of objectives - The group task and product sheets described above were used to test the attainment of the behavioral objectives incorporated in the unit. Ideally, one would want to verify that each individual student has attained mastery of each objective, before he/she progresses on to higher level objectives. Given the emphasis on group work in the present project, this proved to be a problem. Although a degree of individual accountability could be built into the unit (in the form of task sub-division and individual explanations throughout the unit, as well as an individual post-test at the end of the unit) embedded testing of almost all of the objectives was carried out on a group, as opposed to individual, basis. This meant that individual mastery of objectives could

not be ensured. In an attempt to alleviate this problem, students were discouraged from signing their group product sheets until they felt that they had thoroughly understood, and could explain, the answers arrived at by their group. Students unable to explain all answers were encouraged to request further explanation from fellow group members or the instructor. In this way, the attainment of objectives by each individual was at least aided, if not ensured.

5. Corrective feedback - This was provided to all groups, for all work accomplished in the course of the instructional unit. At the conclusion of each lesson, group product sheets were submitted to the instructor. The instructor identified and corrected any mistakes made by the students, and then returned the sheets to the students.

6. Positive interdependence - It has been argued that positive interdependence is one of the most essential ingredient in cooperative group work (Slavin, 1983). If cooperative learning is to be effective, it is essential that the students realize that, in order to succeed, they have to depend on one another. Accordingly, the instructional materials, goals, and activities included in each and every lesson were all carefully designed so as to maximize the promotion of positive interdependence. In this way, the very structure of the unit established a reality of shared concerns, and communicated to the students the necessity of working collaboratively.

7. Participation - The fact that so much of class-time was taken up by cooperative group work, meant that students were constantly obliged to actively participate in the lessons. Since each student carried the responsibility to both learn and, subsequently, teach a certain block of information, participation was kept at a maximum throughout. In this way, a primarily learner-directed and discovery-oriented learning environment was created.

8. Interest - In each lesson, a premium was placed on choosing activities and materials high in interest and relevance for the target population. For example, since it was known that a large number of the students in C210 were drawn from Art Education, materials showing the application of Gestalt principles to graphic design were used in order to explain the principles of Gestalt

psychology. Similarly, several illustrative examples were drawn from English Language and Literature, since these areas were relevant and interesting to the many C210 students learning to teach English as a second language. All of the activities included in the lessons were chosen with student appeal in mind.

For a more detailed description of each individual lesson, the reader should consult the instructor's guide. A copy of the instructor's guide appears in Appendix C of this paper.

10. Design and conduct formative evaluation. The literature is replete with experimental research that has made use of techniques of formative evaluation. A recent ERIC search conducted by Weston (1986) yielded over one thousand citations on the topic for the period 1966-1985, and illustrated that the process has been used extensively for topics such as curriculae, programmes, materials, teachers and teaching. The term "formative evaluation" was first used by Michael Scriven (Tyler, Gagne, & Scriven, 1967) to denote that process of evaluation carried out on educational material during its developmental or "formative" stages, with the explicit intention of improving it. Scriven draws the distinction between formative and summative evaluation, noting that the former is performed during the development of a product, while the latter is used to investigate the product's effectiveness only after its completion. It should be noted that in the case of the present study, all evaluation performed is considered as falling into the category of "formative evaluation" or "formative research" (Baggaley, 1987); none of it is considered "summative", since the exploratory nature of the project in question suggests that it is still in its formative stages.

In the current project, several formative evaluation procedures were carried out, in order to assess strengths and weaknesses in the instructional unit. These are described in the next section.

The Implementation/Evaluation of the Instructional Unit

There is little doubt that formative evaluation of instructional methods and materials improves the effectiveness of the final product. However, considerable disagreement exists regarding the best way to carry out formative evaluation. (Weston, 1986). In the present study, a three-part model of formative evaluation was adopted for use. Based on the approach advocated by Weston (1987) and Dick and Carey (1985), the method consisted of a number of evaluations, carried out by experts and users as follows:

Part 1 - Expert reviewers. The first part of the evaluation entailed having the completed instructional unit reviewed by subject matter, pedagogical and instructional design experts. Earlier in this paper, mention was made of the two educational psychology instructors whose classes were to be used in the present study. One of these instructors being a specialist in learning theories, and the other a specialist in cooperative learning, both women were in an excellent position to provide subject matter and pedagogical expertise to the project. A third individual, this time a professor in educational technology at Concordia University, provided expertise in instructional design. The two subject matter/ pedagogical experts were provided with a detailed description of each lesson contained in the instructional unit, and requested to evaluate its content. More specifically, they were asked to assess the accuracy and comprehensiveness of the subject matter addressed in each lesson, as well as the pedagogical appropriateness of the objectives, learning activities and materials contained therein. For his part, the instructional design expert oversaw and evaluated each step in the design process (including the development of the individual lessons), thus ensuring the adherence, on the part of the researcher, to principles of instructional systems design.

Part 2 - One-to-one evaluation. The completed lesson plans were also given to three educational technology students to evaluate. Although not drawn from the target population itself, all three students had recently taken a course on learning theories which, coincidentally, had required their involvement in cooperative group work. Hence, these individuals possessed invaluable insight into both the difficulties and concerns of university students studying learning theories, and the problems inherent in group work. Moreover, since they were students of educational technology, they also possessed substantial knowledge regarding instructional design. As a result, the one-to-one evaluations carried out by these students yielded feedback addressing a wide variety of issues, from the appropriateness of the chosen learning objectives, to the clarity of the instruction.

Feedback obtained from this and the first phase of the evaluation process was used to modify the instructional unit before the third and final phase was carried out.

Part 3 - Field evaluation. The field evaluation phase comprised two main thrusts:

1. a quasi-experimental assessment of cognitive, affective and sociometric outcomes, and

2. a weekly formative evaluation procedure, aimed at early detection and immediate revision of flaws in the instructional unit.

Both procedures were carried out simultaneously. As illustrated in the diagramme below, a pre-test post-test nonequivalent control group design was employed.

Groups	Pre-test	Treatments	Post-test
A	O1	X1	O2
B	O1	X1	O2
C	O1	X2	O2

133 subjects were left intact in three sections of an undergraduate educational psychology course. Two of the three sections (N = 92) were designated as treatment groups, while the third section (N = 41) was designated as a control condition. The two treatment groups differed slightly, in that they had different instructors, classroom set-ups (regular and tiered) and different meeting times: The first met once a week for two and a half hours, while the second met twice a week for one and a quarter hours each time. The control group shared the same instructor as the second treatment group, and met once a week for two and a half hours. Although the experimental and control groups did not possess the guarantee of pre- experimental sampling equivalence that is inherent in random assignment, it was felt that their recruitment from a common population, with parallel educational backgrounds, would render them sufficiently similar.

Before treatment, all subjects in the experimental condition were assigned to groups of four or five people. Assignment to groups was carried out by the course instructors, according to student ability, such that each group consisted of at least one high, one low, and two medium ability students. Ability level was determined according to subjects' standing in the educational psychology course, up to and including the mid-year (i.e. Christmas) examination. The construction of these heterogeneous ability groups was in keeping with the literature on cooperative learning (e.g., Webb, 1985), which suggests that the benefits of

small group learning are maximized by way of this procedure. Other factors (sex and race) were also considered in the formation of the heterogeneous groups. Subjects were not informed of the criteria adopted for group formation.

Prior to the first instructional session, the subjects in each condition were administered the cognitive and attitudinal pre-tests described earlier in this proposal. Since the majority of students could not respond to the cognitive pre-test, it was stopped after approximately twenty minutes of administration. It should be noted that the results of the cognitive pre-test were not used in this study, because there were very few responses given. The two experimental groups also responded to a social interaction pre-test at this time. These subjects were then exposed for a period of five weeks to the systematically designed instructional unit. At the end of each of these five weeks, the subjects responded to lesson and group processes evaluation questionnaires. In the former, they recorded their reactions to, and assessment of, each lesson, while in the latter, they rated the effectiveness of the cooperative interaction processes that took place among group members, in the course of each lesson.

The two course instructors also evaluated the lessons on a weekly basis, and made observations of cooperative interaction processes in their classes. Each week, the instructors met with the researcher to report on the success or failure of the implemented instructional activities and materials. Group interaction processes among subjects were also discussed at these meetings. Based on both the subject and instructor feedback, modified strategies for subsequent lessons were suggested, and incorporated into the instructional unit.

At the end of the fifth week, in addition to completing the regular lesson and group processes evaluation questionnaires, subjects in the treatment groups responded to a questionnaire which required them to evaluate the instructional unit as a whole. By this, subjects provided information regarding the usefulness

and appeal of the instructional strategies employed in the unit. Furthermore, the subjects were asked to comment on their preference or non-preference for the cooperative/participative approach used, as compared with the lecture-based instructional strategy traditionally utilized in university classrooms.

At the same time as the treatment groups were receiving exposure to the instructional unit, subjects in the control condition attended their regular lectures. These lectures shared the same cognitive objectives, addressed the same topics, and even employed many of the same learning materials (e.g., transparencies and student handouts) as the instructional unit. What differed was the strategy of communicating the content. In the present case, this was done by way of lectures, whereas in the treatment condition, a cooperative-participative-advance organizer strategy was employed.

At the end of five weeks, the subjects in the control condition completed a questionnaire, in which they evaluated the utility and appeal of the instruction they had received during the five week period. Like the subjects in the treatment condition, they were also asked to comment on their preference or non-preference for the lecture-based instructional strategy over a cooperative/-participative approach.

In the sixth week, subjects in both the experimental and control conditions were administered the attitudinal post-test described earlier. Subjects in the treatment groups also responded to a social interaction post-test at this point. Finally, subjects in both conditions were administered the cognitive post-test.

CHAPTER 4

Formative Evaluation Results

Introduction

The three-part model of formative evaluation, adopted for use in the present study, yielded a great deal of information regarding the specific strengths and weaknesses of the instructional unit. The formative evaluation instruments implemented in the study allowed for an accurate assessment of each lesson contained in the unit. As explained earlier, evaluation comments were derived from expert reviewers, one-to-one evaluators, and from students and instructors during the field testing of the unit. The results obtained from each of these sources, for each lesson, are reported below. It should be noted that, based on the evaluations amassed for each lesson, two types of changes to the instructional unit were suggested. These included changes to the lesson itself (carried out **after** the initial field testing of the instructional unit) and changes to subsequent lessons with similar characteristics (carried out **during** the initial field testing of the unit). Both types of changes are described in the following pages.

Lesson 1

Description of the Lesson

Topic:	Introduction to cooperative learning and cognitive learning theories
Objectives:	11.1, 11.2; 1.1-1.8; 2.1-2.7; 3.1-3.9 (see Appendix B) By the end of the lesson, the students were expected to be able to name and identify the interpersonal and group skills necessary for successful group work; name and explain the main principles of Gestalt psychology, Piaget and the open education movement, and Brunerian discovery learning

Time: two and a half hours

Summary of Activities:

1. students form giant jigsaw puzzle depicting cooperative ethic: "We are all in this together; we sink or swim together."
2. instructor delivers short explanation re. cooperative learning, group work, and features of effective groups
3. instructor assigns students to heterogeneous groups
4. students take part in role playing situations depicting effective and ineffective groups; instructor leads discussion re. importance of functioning as an effective group
5. instructor provides advance organizer of unit content, using overhead projector
6. students take part in jigsaw learning activity, employing self-instructional packages to learn material and teach to other group members
7. instructor provides summary of content covered, and answers students' questions

Feedback from Expert Reviewers

The two pedagogical/subject matter experts were largely satisfied with the lesson as it stood, but were concerned that there were not enough "team-building" activities included in this strategically important first lesson to strengthen the ties between the members of the newly formed groups. This problem was exacerbated by the fact that soon after the group members were to come together to perform the role-playing situations, they were to be separated in the Jigsaw learning activity, which required the students to form so-called "expert groups" with members of other groups. It was therefore decided that a number of team-building activities would be inserted into the lesson, immediately following the role-playing activity. These activities were chosen by the subject

matter/pedagogical experts themselves, and included a familiarization activity (in which group members learned each others' names and three bits of information about their fellow group members), a word formation task (in which groups formed as many words as they could out of the word "cooperation"), and a creative activity which called for the students to name, and make a label for, their respective groups. Another team-building activity that was not thought of at the time, but which would certainly be appropriate in the context of the first lesson, is Slavin's "Quibblean Spelling", a coopertative task which places adult learners in the position of young learners learning to spell.

By increasing the number of team-building activities, another problem was created. In this instance, the problem was time. The introduction of more team-building activities into an already full lesson plan meant, in effect, that it was improbable that all the activities designated for lesson 1 would be completed in the space of the two and a half hour time period available for instruction. As it was, the initial part of the first instructional session had been allocated to the returning, and going over, of the mid-year examination, and to the administration of the cognitive pre-test. Hence, the time available for the activities contained in lesson 1 was severely limited. In an attempt to resolve the time problem, the pedagogical/subject matter experts decided that they would simply cover as much of the first lesson's activities as they could in the time available, and deal with the remaining activities in the less full, second lesson.

Apart from these two problem areas, the pedagogical/subject matter experts were highly enthusiastic about the materials developed for use in the first lesson. These they found to be innovative and exciting. The instructional design expert was also impressed by what he termed "the richness and variety" of the instructional materials. In fact, he had no criticism of lesson 1 itself, but he did identify at this point a problem in the overall formative evaluation procedure to be

used for the lessons. It was his opinion that since the researcher was not permitted to actually observe the implementation of the lessons, the instructors should be required to provide feedback regarding the specific problems experienced in each lesson. This advice was considered pertinent, and was accordingly adopted. The only other advice rendered by the instructional design expert at this point was that, in addition to the group processes sheet filled out by every individual at the end of each lesson, it might be useful to have each group rate their performance on a collective basis. This proposal was rejected by both the researcher and the other SMEs on the basis that the process would be too time consuming.

Feedback from One-to-One Evaluators

Feedback obtained from the three educational technology students was also very positive. The greatest problem that they identified was that the instructor's guide lacked clarity. One of the evaluators felt that a more direct and concise explanation of each activity in the lesson would make the instructor's guide more "user friendly". This advice was accepted, and implemented in later lessons, although the detailed descriptions which characterized the lesson plans were, by and large, maintained. This was done because the experimental nature of the project made it necessary to provide the two instructors with very explicit directions regarding what they were to say and do during each lesson. Nevertheless, in terms of future applications of the instructional unit, it has been decided to change the lay-out of the printed instructor's guide to be more readable and simply expressed.

Another of the educational technology students pointed out that time allocations should be specified for each activity in the lesson. This serious omission on the part of the researcher was immediately rectified. The evaluator

indicated, moreover, that the wealth of information and activities contained in the first lesson, while exciting, might be too numerous to cover in the space of the time available. As noted above, the solution decided upon for this problem was simply to defer the overspill of activities from lesson 1 to lesson 2.

Other comments received from this stage of the evaluation process concerned minor spelling and typographical errors in both the instructional materials and teacher's guide. These were also immediately corrected.

Feedback from the Field Evaluation

As explained earlier, evaluation comments derived from the implementation stage of the project were obtained from two sources: The students in the two experimental groups, and the instructors. It should be noted that the lesson evaluations received from the two groups of students differed considerably. One explanation for this difference might reside in the possibility that instructor variables affected the students' perceptions of the lessons. Another possibility is that the two classes of students simply responded differently to the materials and activities contained in each lesson. For this reason, feedback obtained from each group has been analyzed separately. Results gathered for each lesson, as well as for the overall unit, have been graphed, and appear in figures 2 - 10. Feedback comments received from both the students and instructors are summarized below.

Group1. Feedback obtained from this class tended to be quite negative. Shortage of time proved to be even more of a problem than initially expected. This was due to the fact that it took the instructor much longer to return and go over the mid-year examinations than she had anticipated. As a result, the instructor only managed to get as far as activity 4 of the lesson plan, and did not

even begin to touch on the cognitive learning theories. Lack of time forced the instructor to rush through the explanations of those activities she did reach, and the students therefore found the activities unclear. They expressed dissatisfaction with the fact that the rationale behind each activity (i.e., why they were doing what they were doing) was not well explained. Many found some of the activities (particularly the team-building activities) poorly suited to their age level. Perhaps the biggest problem which affected the lesson was one unattached to the actual learning activities themselves: The thermostat controlling the heat level in the classroom malfunctioned, making the room over 90 degrees Farenheit. This made the students feel uncomfortable and made the lesson drag.

Group 2. The second group of students had an advantage over the first group in that they had an additional hour-and-a-quarter-long class period in which to carry out administrative tasks, such as reviewing the mid-year examination, and completing the cognitive pre-test. This additional lesson owed its existance to the fact that the winter term commenced on a Wednesday, one day after the regular meeting time of Group 1, and one day before that of Group 2. This meant that on the Tuesday of the first full week of the semester, Group 2 could begin immediately to cover the activities contained in lesson 1, since they had already dispensed of the administrative prerequisites on the previous Thursday.

The students in Group 2 responded positively to the first lesson. On the whole, they enjoyed the activities and had no problems with any of the materials. Unlike Group 1, they felt that the team-building activities were appropriate, but did not particularly enjoy the role playing activity. They were able to get well into the jigsaw learning/teaching activity, and experienced no difficulties with the

instructions and materials contained therein. The instructor did report, however, that those students in the Gestalt expert groups took longer than students in the other expert groups to get through all of the material, and that this left students in the other groups waiting around for the Gestalt experts to complete their assignments. Moreover, the instructor felt that the size of each expert group was too large, and that this slowed the learning process.

In terms of the pacing of the first lesson, the majority of the students in Group 2 found it a little too fast, and commented that the amount of materials was a little too great. Other than this, the students had no criticisms of the lesson. On the contrary, many indicated that they greatly enjoyed the lesson, and found it highly interesting.

Changes to lesson 1. The fact that the two classes responded so differently to the learning activities contained in lesson 1 makes it difficult to revise the lesson in a fashion that would render it more suitable for all of the learners. Consequently, activities such as the team-building exercises and the role playing scenarios should be designated as optional, and future instructors advised to choose other activities to replace any that they feel are poorly suited to the specific characteristics of their students. Feedback obtained from Group 1 regarding the clarity of the explanations they received, suggests that further explication of each activity in the lesson is required. It is obviously of utmost importance that the students understand at all times what they are doing and why they are doing it. Although this fact was pointed out in the original lesson plan, and activities included to ensure clarity, it appears from the lesson evaluations that further stress must be placed on providing clear explanations to the students. As far as the issue of one group finishing before the others is concerned, this is a problem characteristic of all group work of this type; it is

unlikely that all groups will complete learning activities at exactly the same time. While little can be done to alleviate this problem, it is suggested that, in the present case, the instructor should encourage those groups which finish early to either review the work that they have just completed, or to start thinking about possible teaching applications of the theories they have studied.

An additional modification to lesson 1 was suggested, as a result of feedback obtained from Group 1 during the second class session. This change is reported in the section dealing with lesson 2.

Changes to subsequent lessons. It was decided that in subsequent lessons involving the jigsaw learning strategy, three expert groups instead of two would be formed for each topic area. This would reduce the number of students in each expert group, and make the learning procedure more managable. Given the problems found in the pacing of the first lesson, an attempt was made to reduce somewhat the amount of material included in the following lessons. This attempt was limited, however, in that all of the content initially included in the instructional unit had to be covered by mid-semester. That is to say, none of the course content could be omitted from the unit. Instead, shorter ways of dealing with the content, without disrupting the designated cooperative-participative-advance organizer instructional strategy, were sought. Another problem associated with slowing down the pace of the subsequent lessons was that, since both groups were to be tested on the same material at the end of the five-week instructional period, Group 1, having fallen seriously behind Group 2 by the end of the first lesson, would have to play a game of "catch-up" in order to close the gap that had developed between the two classes. This meant that Group 1 would have to work through the learning activities and materials at an even faster pace than originally anticipated.

Lesson 2

Description of the lesson

Topic: Classroom applications of cognitive learning theories

Objectives: 4.1 and 4.2
By the end of the lesson, the students were expected to be able to match examples of specific classroom practices with the key cognitive theories covered, and recognize the applications of the baseline theories in a classroom situation

Time: two and a half hours

Summary of Activities:

1. students complete the jigsaw learning/teaching activity, begun during the previous lesson
2. instructor-leads discussion: Why do we study learning theories?
3. instructor shows film, "The Happy Revolution", depicting cognitive theories applied in the classroom; instructor leads discussion re. which theories were depicted by the film
4. students given scenario of cognitive theories applied in the classroom; with instructor's guidance, students match each application to a theory
5. students given other application scenarios; in groups, they identify the base-line theories represented by the applications
6. instructor provides summary of content covered, and answers students' questions
7. instructor assigns humanistic education task sheet as homework for next class

Feedback from Expert Reviewers

The three expert reviewers levelled very few criticisms at lesson 2. In terms of the lesson itself, only two small changes were suggested and made. The first of these changes involved the scenarios that were to be provided to the students as illustrative examples of cognitive learning theories applied to classroom teaching. Originally, the students were to be given three scenarios; one to work on with the instructor, and the other two to complete with their fellow group members. Owing to time constraints, and a belief that fewer scenarios would adequately convey the desired concepts to the students, it was unanimously decided to reduce the number of application scenarios from three to two. The second change involved the insertion of a short film clip into the lesson, immediately before activity 3. Both the SMEs and the researcher felt that it would be advantageous to show the students an example of a classroom situation in which no cognitive theories had been applied, and to juxtapose this with an example of a class in which the theories had been employed. It was thus decided that a two-minute-long clip of the feature film, "Ferris Bueler's Day Off" would be shown to the students, before progressing to the documentary, "The Happy Revolution". The choice of the feature film was made on the basis that it depicted, in an exaggerated format, what happens when cognitive theories are not employed, and that it was known to be high in student appeal.

For his part, the instructional design expert detected one small error in the specification of the behavioral objectives pertinent to lesson 2. He objected to the fact that objective 4.2 called for the students to derive general applications of the Cognitive theories, but did not specify how the students were expected to do this. On closer inspection, the researcher realized that it was not necessary for the students to be able to **derive** the applications; rather, they had to simply **recognize** them. Since the latter behaviour had already been specified by

objective 4.1, the researcher and SMEs accordingly decided to remove the teaching of objective 4.2 from the instructional unit.

Feedback from One-to-One Evaluators

Since lesson 2 was submitted to the one-to-one evaluators at the same time as lesson 1, feedback received for the former was similar to that received for the latter. Once again, comments regarding the format of the instructor's guide and the necessity of attaching time allocations to all activities were registered by the evaluators. These issues were revised in the manner explained on pages 73-74. One difference in the two lessons was, nevertheless, noted. The evaluators believed that the activities in lesson 2 were somewhat more realistically suited to the instructional time available than those contained in lesson 1, and that this fact would slow down the pace of the lesson.

Feedback from the Field Evaluation

Group 1. Once again, the students in this group accomplished far less in the course of the lesson than expected. It took the students considerably longer to work through the jigsaw learning activity (from lesson 1) than it did their counterparts in Group 2. Indeed, by the end of the second class period, they had only reached activity 3 of lesson 2. What is more, students in Group 1 experienced major difficulties with the materials used in the jigsaw activity, whereas those in Group 2 experienced none. One reason for these difficulties lay in the fact that the materials had not been put back in order, after having been used earlier in the day by Group 2 students. Another reason resided with an inconsistency in the learning materials themselves. The students found it impossible to locate the answer to question #5, pertaining to Gestalt psychology, on the Group Task Sheet. The information had indeed been supplied to them in

the Gestalt expert group learning package, but unlike the other objectives in that package, whose numbers had all corresponded with the number of the card on which the concept was explained, mastery of objective #4 depended on deriving information from card #3. This lack of consistency confused the students considerably.

Evaluation comments derived from the students showed that many of them struggled with the clarity of the explanations they received. They indicated that the initial overview of the cognitive theories provided by the instructor was not sufficient to give them a clear picture of how the various sub-topics they studied fit together. The majority of the students found the pacing of the lesson too rapid, and many commented that there was too much material to cover in the time provided. Similar to the students in Group 2, those in Group 1 suggested that the expert groups were too large, and that this hindered learning. This made the students feel rushed and anxious. Nevertheless, most of them found the lesson interesting, and felt that they learned a great deal. They loved the clip from "Ferris Bueler's Day Off", and groaned when the instructor turned off the video player.

Group 2. The greatest complaint received from this group of students was that they needed more time to do all of the activities contained in the lesson. These they thoroughly enjoyed, and felt cheated by the fact that they could not spend more time on each. The students felt that the application scenario, while challenging, was a little tricky, since they were not initially aware that more than one theory could be linked with each application. They also complained that there was not sufficient space left on the scenarios for them to write in their answers. Finally, they pointed out that the fact that each group had only one copy of the scenario with which to work, made it difficult to function efficiently.

Changes to lesson 1. Based on feedback from Group 1, the following additional modification should be made to lesson 1: Objectives #3 and #4, listed on the expert group guide sheet for Gestalt psychology, should be combined into a single item, and the information pertinent to each, placed on one activity card, as opposed to two. Obviously, this modification necessitates a changing of the numbering of each subsequent objective and activity card contained in the Gestalt learning package.

Changes to lesson 2. Three changes are suggested for lesson 2, all of which pertain to the application scenario. First of all, it has been decided that spaces should be left on the sheets of paper containing the application scenario. These spaces will allow the students to insert their answers more easily. Secondly, in future applications of the instructional unit, at least two copies of the scenario should be provided to each "home group". Initially, we chose to limit the number of copies given to each group because we believed that the provision of only one copy of the scenario per group would oblige group members to work cooperatively on the assigned task. Unfortunately, this plan backfired somewhat, since having only one copy per group turned out to be more of a hindrance than a help for group members. Finally, it should be stressed to the students that each application may be linked with more than one theory.

Changes to subsequent lessons. By the end of the second lesson, it became clear that there were far too many activities included in each lesson for the students to get through in the time available. A decision was therefore taken to reduce the number of activities in each subsequent lesson, and in this way, to slow down the pace of instruction. As far as Group 1 was concerned, it seemed obvious that unless drastic steps were taken, the students would never manage

to cover all of the material that they were required to know for the mid-term examination. Hence, a number of the group-based activities contained in lesson 3 were either shortened or designated as teacher explanations. In this way, it was hoped, Group 1 would be able to catch up with Group 2, in time for the fourth lesson of the unit.

Finally, in response to complaints forwarded by the students regarding the unavailability of sufficient copies of materials, additional copies of materials were made for all group tasks contained in each subsequent lesson, and provided to the students.

Lesson 6

Description of the Lesson

Topic:	Humanistic Education
Objectives:	5.1-5.20 By the end of the lesson, the students were expected to be able to describe the general thrust of humanistic education, the factors leading to its popularity and decline, and the main principles contained in the approach. In addition, the students were expected to evaluate the appropriateness of humanistic techniques in terms of current educational practices, and explain how these techniques may be modified to better suit current practices.
Classroom set-up:	Statements reflecting humanistic principles were hung up around the room and learning centers set up. The attempt was to simulate, as closely as possible, the features of a humanistic classroom
Time:	two and a half hours

Summary of Activities:

1. instructor leads students through feeling exploration activity
2. students browse through learning centers
3. instructor reads students story of the animal school, and explains context and concerns of humanistic education
4. instructor takes-up humanism task sheet and reading of Chapter 9 of text book, completed at home by students
5. students construct picture of 9 basic features of humanistic education
6. instructor leads discussion re. decline in popularity of humanistic education; students take part in values clarification activity re. current relevance of humanistic practices
7. students work in groups on scenario of modified and unmodified humanistic education practices
8. instructor provides summary of content covered, and answers students' questions

Feedback from Expert Reviewers

The two SMEs were almost completely satisfied with the lesson as it stood. Once again, they found the chosen activities and materials highly innovative and exciting. They did, however, change one feature of the lesson: Originally, the students were supposed to visit the learning centers in their respective home groups, and the instructor was asked to control the amount of time that each group spent at each center. It was felt that this type of "regulation" by the instructor ran counter to the humanistic atmosphere that the lesson was attempting to create, and that some students would naturally want to spend

longer periods of time at certain centers than at others. It was therefore decided that the students would be informed of the total amount of time that they could spend working through all of the centers, and that they would have the freedom to choose the percentage of that total time that they wanted to expend on each specific center.

Like the two SMEs, the instructional design expert had few criticisms of the lesson itself. He did not, however, approve of objective 5.20a, an objective which called for the students to explain how humanistic techniques may be modified to better suit current educational practices. The instructional design expert felt that this objective was strange in that it seemed to require the students to support current educational practices, and tended to demean the humanistic approach. This point was accepted as having merit, but the SMEs and researcher agreed, nevertheless, to maintain the objective, since it did infact reflect the position of current pedagogical thought, and corresponded with the opinions presented in the text book. Another problem raised by the instructional design expert concerned the numerous books that were to be displayed at the learning centers. He was concerned that the students would be expected to read all of these books. In actual fact, the true desire of the researcher in including these books was simply to encourage the students to glimpse at the titles, and page through those that caught their attention. In this way, it was hoped, the students would gain a preliminary impression of the concerns and interests of great humanists, such as Rogers, Combs, Gordon and Purkey. In response to the instructional design expert's comment regarding this issue, the instructors were simply reminded that the students were not expected to actually read through any of the books exhibited at the learning centers.

Feedback from One-to-One Evaluators

Of the three one-to-one evaluators, two were highly satisfied with the lesson. These two individuals strongly approved of the time allocations that had been attached to each activity, and felt that the times estimated by the researcher were accurate. They noted that the concepts, objectives, and the implementation of the objectives in the lesson were all clear and precise. They also praised the format of the entire lesson which, they felt, would ensure the active participation of the students in a humanistic education experience. The only doubt raised was whether the lesson would be sufficiently intellectually challenging for the students. On consideration of this issue, the researcher decided that even if the lesson were not in and of itself challenging, the concepts covered would provide substantial food for thought for the students. Hence, no attempt was made to render the lesson more intellectually challenging.

The third one-to-one evaluator noted several problems with the specification of various elements within the written lesson plan. First of all, he felt that the section describing the materials required for the lesson should be more specific regarding the number of materials needed. Secondly, he considered that the description of the learning centers could be greatly enhanced if a sample layout of the room were drawn, and a more succinct specification of a typical learning center provided (e.g., table, two chairs, etc.). Moreover, he questioned whether the purpose of the feeling exploration activity (i.e., activity 1) should be explained to the students, and if so, when. He also pointed out that the purpose of the learning centers (that is to say, the specific factors that the students should look out for, and/or learn from the centers) was not made explicit enough to the students.

All of the above comments, made by the third evaluator, were considered pertinent. Unfortuntely, feedback received from this evaluator arrived too late for

the researcher to change the lesson before its initial implementation in the field. Nevertheless, the following changes are suggested for future applications of the lesson:

1. In the section entitled, "Materials", the entry, "magazines, scissors, bristleboard, glue, crayons/markers" should now read, "sufficient magazines, scissors, bristleboard, glue, crayons/ markers for each home group".

2. An illustration of the overall layout of the classroom should be appended to the lesson plan, with each learning center depicted as employing one single desk on which materials are displayed.

3. The lesson plan should request the instructor to explain the purpose of activity 1 to the students immediately **after** the activity is carried out (thus maintaining the novelty/curiosity element, so essential to the impact of an opening activity of this sort).

4. The purpose of the learning centers must also be explained to the students, but this time, the explanation should be provided immediately **before** the activity, so that the students know, from the outset, exactly what they are expected to gain from the centers. More specifically, the students should be told that they are not expected to absorb all of the information displayed at the centers; they should spend their time merely browsing at each center, and in this way obtain an overall impression of the basic concerns and interests of humanistic education.

Feedback from the Field Evaluation

Group 1. On the whole, students in Group 1 tended to respond more positively to this lesson than they had to the previous two. The majority of the students found the lesson clear, and felt that it was helpful to them. The students indicated that they were interested by the lesson, and that they learned a fair amount from it. They responded very favorably to all the materials, and particularly enjoyed the learning centers and the animal story.

Despite this more positive feedback, pacing still proved to be a major stumbling block for many of the students. Their lesson evaluation sheets contained many pleas to slow down the pace of, and provide more time for, the learning activities. Clearly, the students believed that they were being given far too much material to integrate in so short a time, and this made many of them feel anxious. They were especially dissatisfied with the amount of time made available to the "experts" for teaching their respective home groups. As mentioned earlier, it had been conceded that the instructor for Group 1 would have to move her students through each learning activity relatively quickly, in order to close the gap that had developed between the two groups of students involved in the study. This, she did. In the space of the third instructional period, Group 1 students completed lesson 2, and worked through almost all of the activities included in lesson 3. This achievement was not accomplished without a price, however. A number of students now began to indicate that they preferred a lecture approach to the small-group learning approach being used, and considered the former to be more efficient than the latter. This attitude would later be reflected in the students' final evaluations of the overall instructional unit, and in the attitudinal post-questionnaire that they filled out on completion of the unit.

Other comments received from Group 1 students at this point illustrated that they were not sure of what, nor how much, they were expected to learn from the centers. Finally, many complained about the temperature in the classroom which once again surpassed 90 degrees.

Group 2. The great majority of the students in Group 2 responded extremely positively to every aspect of the lesson. Feedback collected from them indicated that they thoroughly enjoyed the activities and materials, and felt that

they learned a great deal from the lesson. However, like the students in Group 1, the students in this class also experienced problems with the pacing of the lesson. Many found that there was too much to cover in the time available. They too were not sure of what they were supposed to learn from the centers, and indicated that they would have appreciated further clarification of this activity. Another comment forwarded by the students in this class was that the application scenario was a little tricky. Nevertheless, many reported that they enjoyed the challenge of this activity.

In direct opposition to the students in Group 1, the students in Group 2 began to display signs of greatly favouring the small-group learning approach being used, over the conventional, lecture-based strategy that they normally received. Completely voluntarily, students in this class elected to meet with their respective group members outside of classtime to discuss their work. Many were observed arriving at university an hour early each lesson morning, in order to confer with fellow group-mates. It should be noted that rising a full hour earlier on a cold winter's morning in Montreal is no mean feat! The instructor received numerous verbal comments from the students regarding how much they were enjoying the lessons, and many requests to continue using the small group learning approach fof the rest of the semester. Moreover, the instructor reported significantly lower absenteeism for this class: In the first three weeks of the field testing period (during which time Group 2 met for six classes), except for one student who missed the first class, there were no students absent. In light of the knowledge that attendance in undergraduate university classes is traditionally low, the high attendance demonstrated by Group 2 was deemed to be an achievement of considerable magnitude.

Like those of the students in Group 1, the above-noted attitudes of Group 2 students would be reflected in their final evaluations of the overall instructional unit, and the attitudinal post-test.

Changes to Lesson 3. Drawing on the feedback received during the field testing of lesson 3, it was decided that more specific directions regarding the purpose of the learning centers should be provided to the students. This should be accomplished in the manner described in the section above, regarding feedback from the one-to-one evaluators. A second obvious change that had to be effected was a reduction in the pace of the lesson. Since this criticism applies to almost every lesson contained in the instructional unit, suggestions as to how to modify the pace appear in the section addressing the overall evaluation of the unit (c.f., page 114).

Changes to Subsequent Lessons. It now became painfully obvious that the number of materials and activities included in each lesson was simply too much. A decision was therefore taken to reduce substantially the bulk of learning activities in lesson 4. Recognizing the necessity to slow down the pace of the lessons, the researcher elected to introduce a simpler, and less time-consuming cooperative activity into lesson 4, and to minimize the number of reading materials provided to the students in the expert groups.

Lesson 4

Description of the Lesson

Topic:	Information processing
Objectives:	6.1-6.18; 7.1-7.13 By the end of the lesson, the students were expected to be able to define information processing, as well as name and explain the structures and control processes in the brain involved in information processing (according to the Atkinson-Shiffrin model). In addition, the students were expected to name and explain various methods for improving learning and recall.

Time: Two and a half hours

Summary of Activities:

1. instructor delivers short introductory lecture re. information processing
2. students take part in two memory activities, led by the instructor
3. instructor informs students of the historical context of information processing
4. instructor provides advance organizer of topics to be covered in information processing
5. students take part in cooperative activity in which they learn various different aspects of the Atkinson-Shiffrin model of information processing, and subsequently teach what they've learned to rest of class
6. students take part in jigsaw learning activity, employing self-instructional packages; in expert groups, learn strategies for improving memory and recall, and subsequently teach what they've learned to other group members
7. instructor provides summary of content covered, and answers students' questions

Feedback from Expert Reviewers

Feedback received from the expert reviewers for lesson 4 contained no criticisms. The strategies suggested by the researcher for decreasing the pacing of the lesson were unanimously supported by both the SMEs and the instructional design expert. No problems were detected in the overall design of the lesson, nor in the specification of the learning activities and materials.

Feedback from One-to-One Evaluators

All three educational technology students commented positively on the lesson. They felt that the lesson plan was more clearly and succinctly expressed than its precursors had been. As for the lesson itself, it was judged to be slower paced, and considerably embellished by the clear directions and explanations it provided for the students.

Feedback from the Field Evaluation

Group1. On the whole, reaction by this group to lesson 4 was quite positive. The instructor reported that student participation and interest in the lesson were high, almost throughout the instructional period. Feedback obtained from the students themselves supports this claim. It appears that the students found this lesson much clearer than the previous ones. In addition, levels of interest and amount learned were rated higher on the evaluation questionnaire, while anxiety levels were clearly lower than in the past. (Note: The classroom was much cooler on this day, and this fact might partially account for the drop in anxiety level.).

The memory activities included in the lesson were particularly well-received. Both the instructor and the students felt that these activities clearly demonstrated the concepts in question. Some problems were experienced, however, with the first cooperative activity (#5 above) in the lesson. Two of the groups did not understand the concepts clearly, so that when it came time for them to present what they had learned to the rest of the class, they reported some incorrect information. It was felt that their failure to comprehend these issues was due to the fact that the instructor had elected to omit from the lesson the advance organizer which explained these concepts (c.f., activity 4). The instructor

corrected the errors made by the students, and, realizing her mistake, used the original advance organizer to review the concepts at the conclusion of the cooperative activity.

The overall impression reported by both the instructor and students in Group 1 was that this lesson went better than the previous three. The instructor felt less rushed, and managed to accomplish more of the planned activities. The students found the pacing of the activities and the amount of materials more appropriate, although some still indicated problems in this area. A fair number of students still thought that the pacing was a little too fast, while a handful commented that the lesson was too drawn out and somewhat boring. Nevertheless, the majority of the students considered the pace at which the lesson progressed to be appropriate.

Finally, the students indicated that they were getting to know each other well, and that they were adjusting to the new instructional strategy.

Group 2. Extremely positive feedback was received from Group 2 students for this lesson. The students appeared to experience no difficulty with any of the activities, and many commented on the fact that they greatly enjoyed working in the now smaller-sized expert groups. The students enjoyed the activities and approved of the materials. Perhaps the most positive outcome of the lesson was that a large majority of students felt that the pacing of the activities and amount of materials provided were just right. Indeed, as many as 80% of the students reported that the pacing of the lesson was suitable, while 86% felt that an appropriate amount of materials had been provided.

Changes to Lesson 4. Based on the above feedback, only one minor change should be made to the lesson: Having witnessed the problems in student

comprehension which resulted from the instructor's decision to leave out the advance organizer, the researcher believes that it would be expedient to stress in the lesson plan the importance of including an advance organizer. Hence, the paragraph in the lesson plan which tells the instructor to provide the prepared advance organizer should now include the following sentence:

> Warning: Failure to provide students with an overall, advance organizer of the content to be covered in the following activity, may result in serious miscomprehension of the concepts.

Changes to Subsequent Lessons. Since the feedback from lesson 4 did not necessitate modifications to subsequent lessons, none were made.

Lesson 5

Description of the Lesson

Topics:
- Applications of Information Processing
- Synthesis of learning theories into classroom practices
- Review

Objectives: 8.0 and 9.0 (TPO #1)
By the end of this lesson, the students were expected to be able to identify the classroom applications of information processing theories. In addition, they were expected to prescribe appropriate teaching strategies based on all three of the learning theories studied in the course of the instructional unit. Finally, any questions the students might have regarding any of the material covered in previous lessons, were to be clarified by the instructor.

Time: two and a half hours

Summary of Activities:

1. instructor alerts students to lesson's activities
2. instructor teaches students how to identify classroom applications of information processing theories

3. students work in groups to identify classroom applications of information processing theories

4. instructor explains to students how to use the theories that they've learned to help them choose appropriate classroom practices

5. students work in groups, applying learning theories to classroom situations

6. instructor provides summary of content covered in this and previous lessons, and answers students' questions

Feedback from Expert Reviewers

Once again, the two SMEs were completely satisfied with the lesson as it stood, and suggested no modifications. The instructional design expert was also pleased with the lesson, but suggested that additional practice/feedback activities should be provided at the end of activity 4, so that the students would gain a clearer understanding of how to apply learning theories to classroom teaching. While this suggested modification was considered both pertinent and desirable, time constraints made it impossible to incorporate the additional exercises into the lesson.

Feedback from One-to-One Evaluators

No problems were detected for lesson 5 by any of the three one-to-one evaluators. As with lesson 4, the evaluators found the lesson plan clear, and commented that the lesson itself contained appropriate and interesting activities. They were especially pleased with the way in which all the concepts dealt with in the course of the instructional unit were here drawn together, and summarized.

Feedback from the Field Evaluation

Group 1. Feedback obtained from this group tended to be quite negative. After the relatively positive evaluations received for lesson 4, the researcher was surprised to see that the students now claimed to have learned less, and found lesson 5 less interesting than most of the previous lessons. Moreover, the students' responses indicated that they found this lesson considerably less clear and helpful than lesson 4 had been. There was also evidence that the large majority of the students considered the pacing of the lesson to be too fast for them. Strangely enough, the written comments collected from the students do not reflect the above evaluations. Indeed, apart from several complaints that the pacing of the lesson was too rapid, the students do not criticise the lesson whatsoever in their written feedback; many even praise it. It is therefore not clear what it was specifically that they did not like about the lesson. What is clear, however, is that the students responded particularly negatively to questionnaire items regarding the interest level and amount learned from the lesson. It may be, then, that they simply found the lesson boring, and that this fact contributed to the overall negative feedback recorded by the group as a whole.

Group 2. In complete opposition to Group 1 students, students in Group 2 responded extremely positively to the lesson. Every student, without exception, felt that the lesson was clear and interesting, and that they learned substantially from it. All but one student claimed that they found the lesson helpful, and most believed that the amount of materials provided was appropriate. Pacing was the only problem identified by Group 2 students for this lesson.

Changes to lesson 5. Since the source of the problems experienced by Group 1 remains unclear, it is extremely difficult to suggest appropriate revisions for the lesson. Ordinarily, one might be tempted to simply try changing various aspects of the lesson, in an attempt to somehow locate the pertinent problem areas. In this case, however, given the extremely positive evaluations supplied by Group 2 students, the researcher feels that such a step would be unwise. Further field testing of the lesson is therefore suggested, before any modifications are effected. Changes should, of course, be made to the pacing of the lesson, since this issue was clearly indicated by both groups as being problematic. As noted earlier, pacing was identified as a major difficulty in almost every lesson contained in the instructional unit. For this reason, suggestions as to how to modify the pacing of the lessons are not made here, but appear rather in the final section of this chapter, in which the evaluation of the entire unit is addressed.

Attainment (Mastery) of Behavioral Objectives

Before progressing to the evaluation of the instructional unit as a whole, some mention should be made regarding the extent to which the students were successful in attaining the behavioral objectives. For reasons explained earlier, it was not possible to test student mastery of objectives on an individual basis. Instead, mastery of each objective included in the instructional unit was tested on a group basis.

Based on their weekly responses to test items embedded in the group product and group processes sheets, all groups were observed to display mastery of all objectives, both cognitive and affective. The instructors had been informed, at the commencement of the unit, that any problems they detected by way of either of these two testing instruments should be pointed out to the

Figure 2: Student Assessment of Lesson Clarity

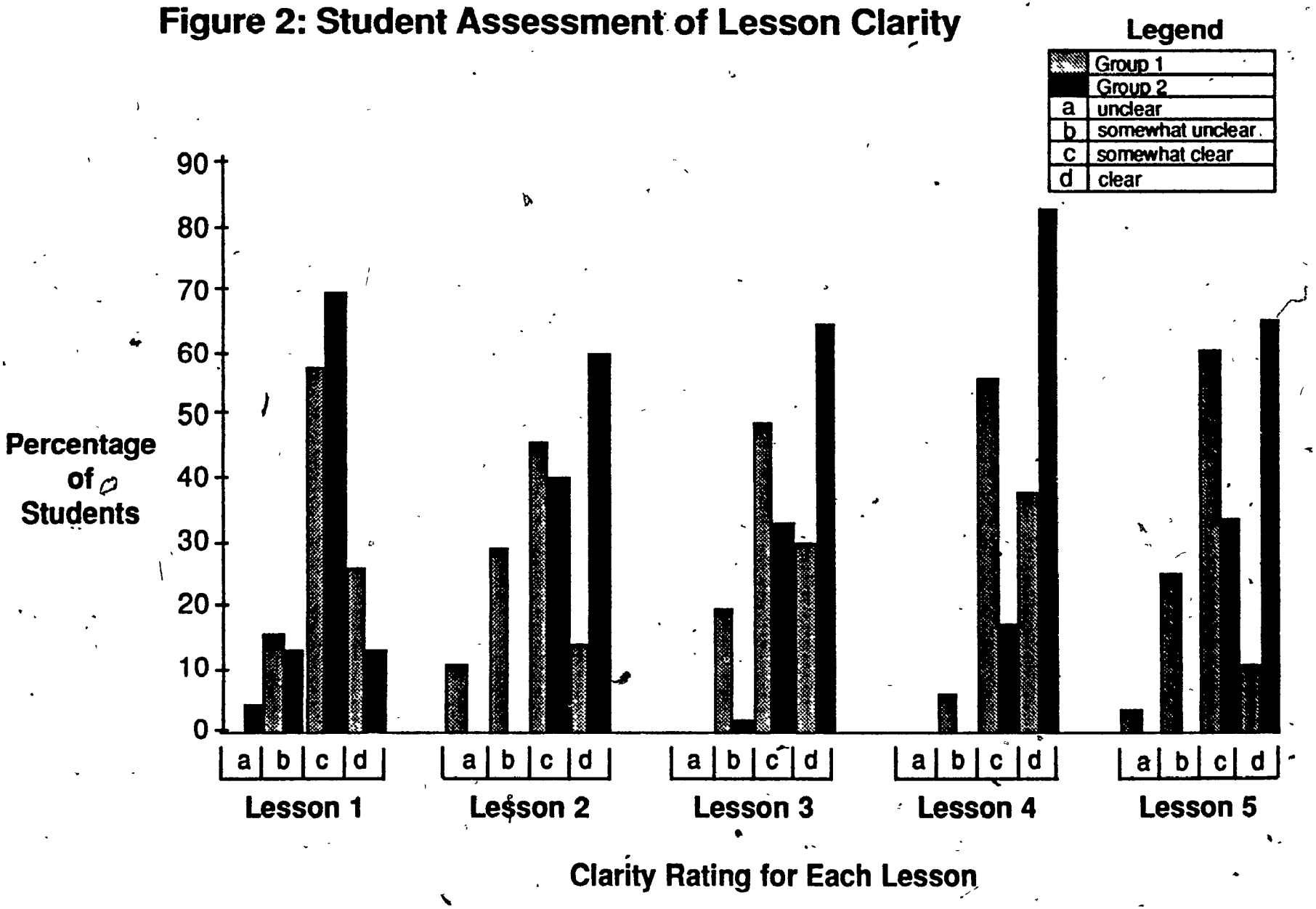


Figure 3: Student Assessment of Lesson Helpfulness

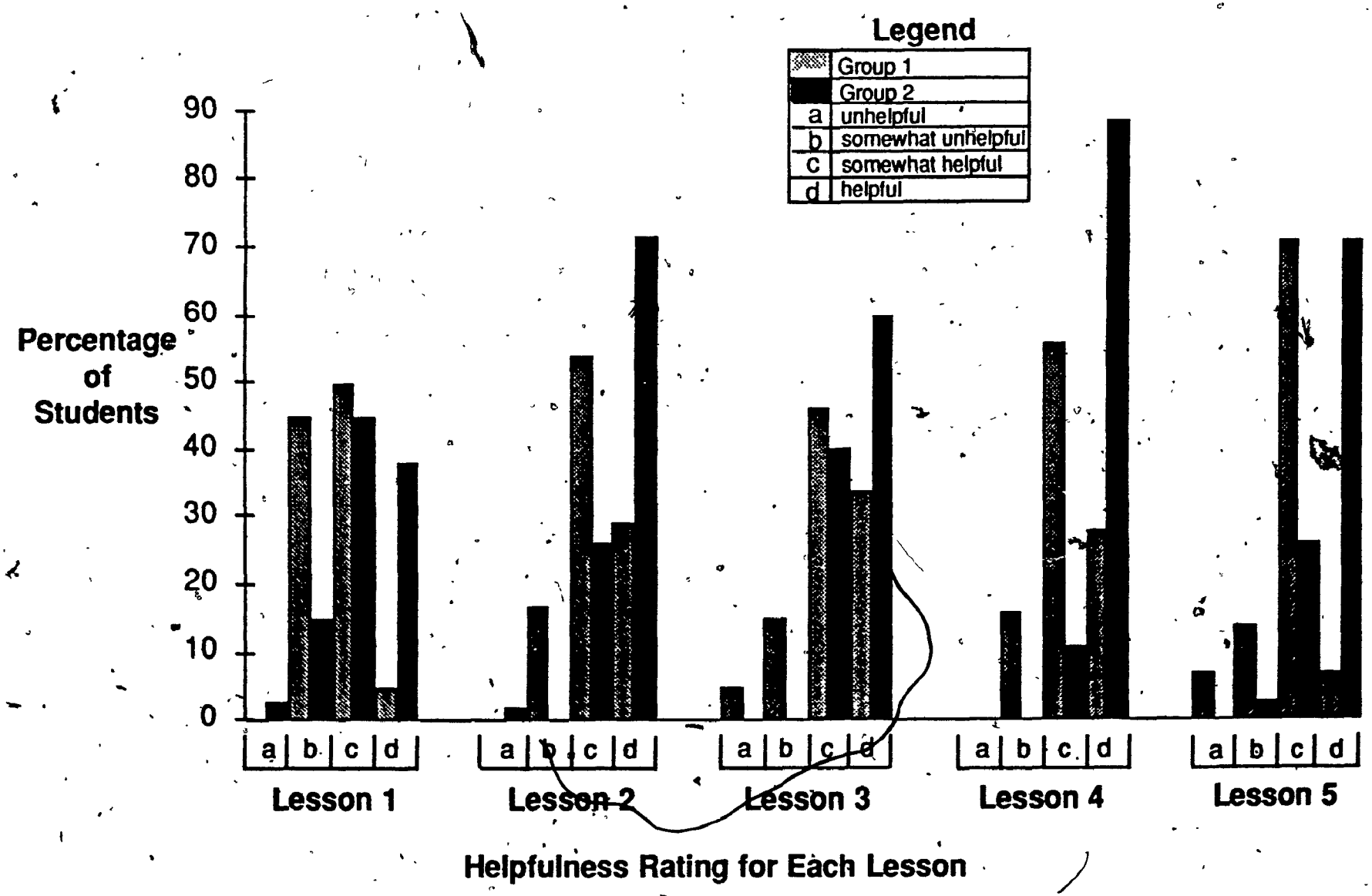


Figure 4: Student Assessment of Lesson Interest

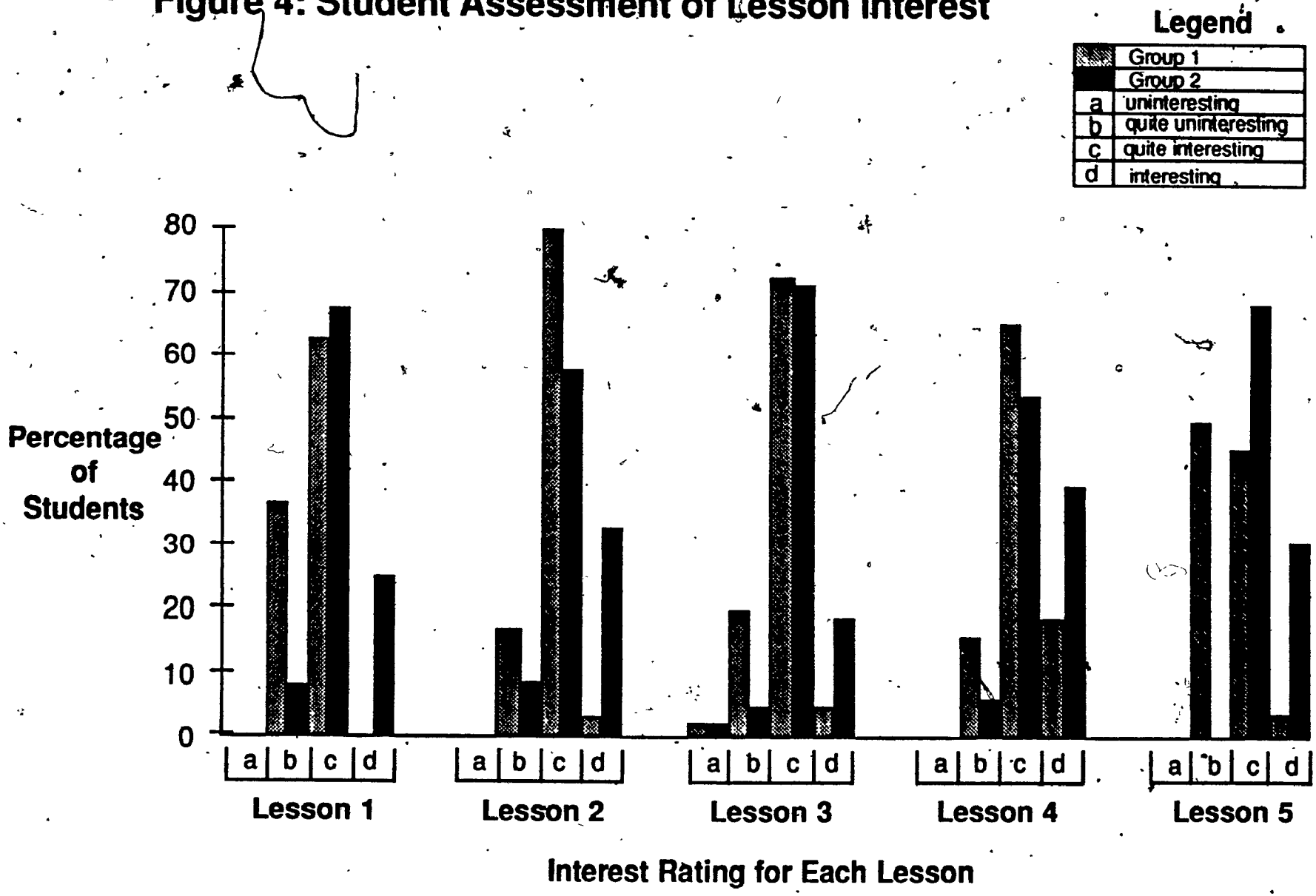


Figure 5: Student Assessment of Amount Learned from Lessons

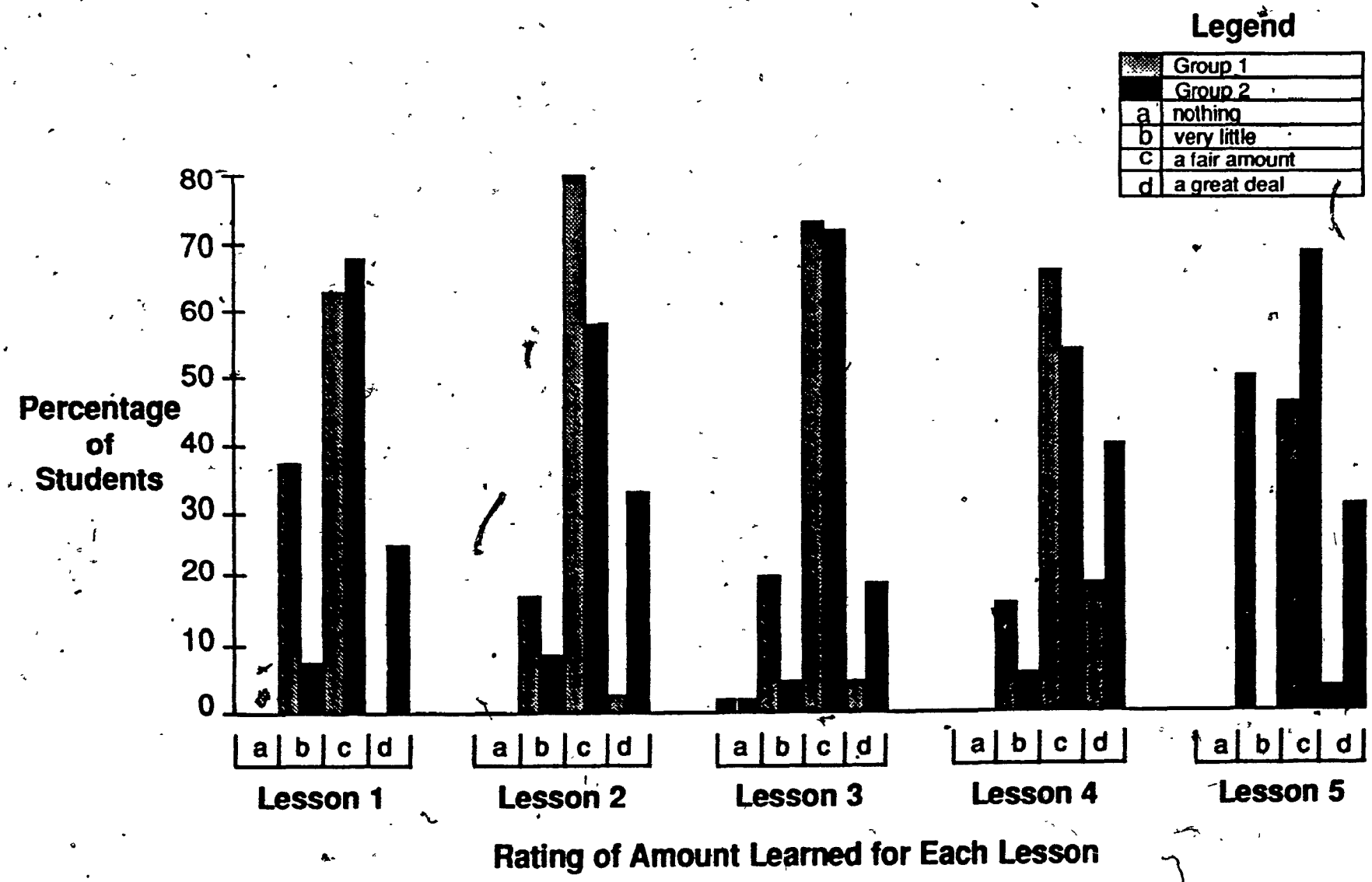


Figure 6: Student Assessment of Lesson Pace

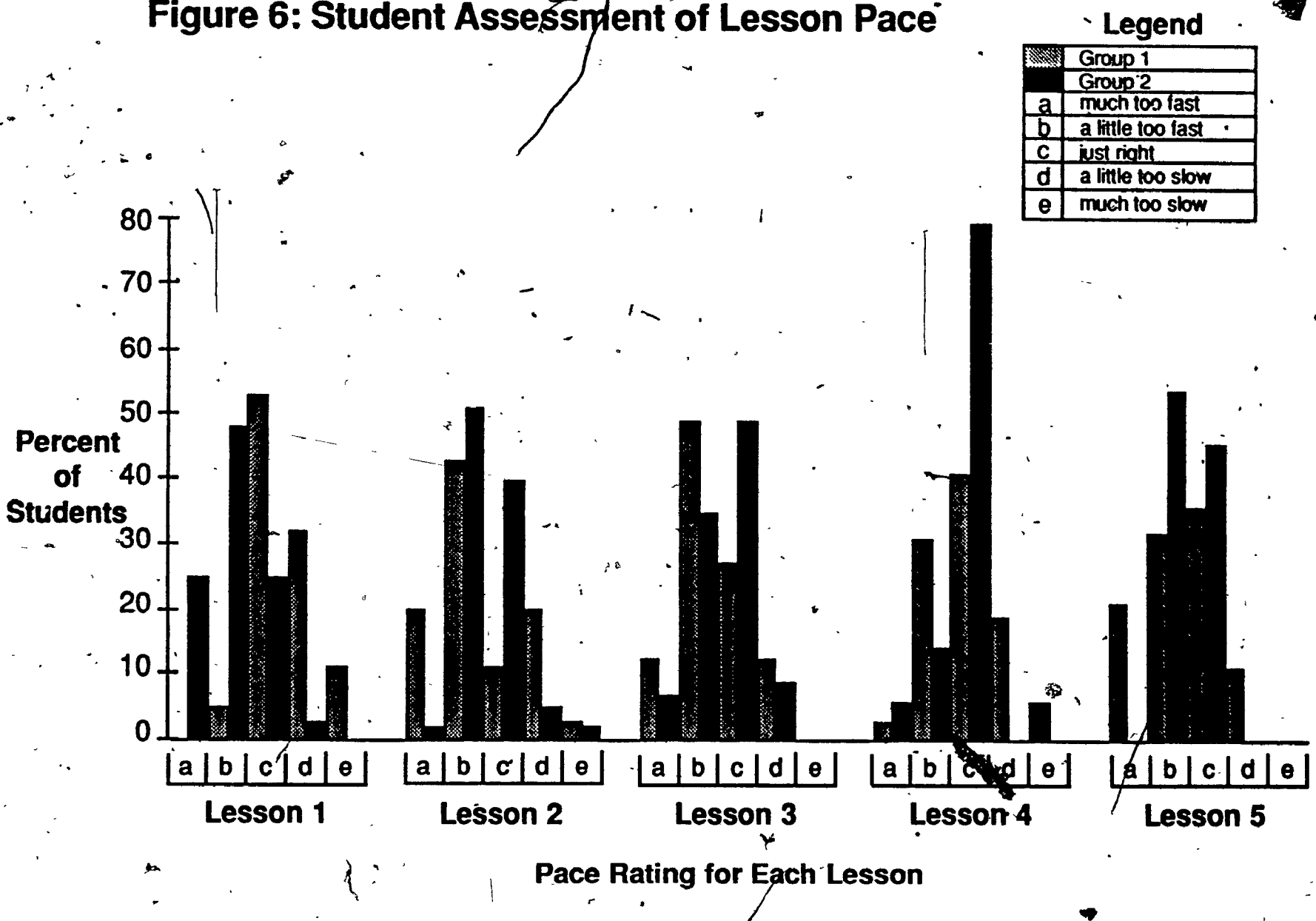


Figure 7: Student Assessment of Anxiety due to Lessons

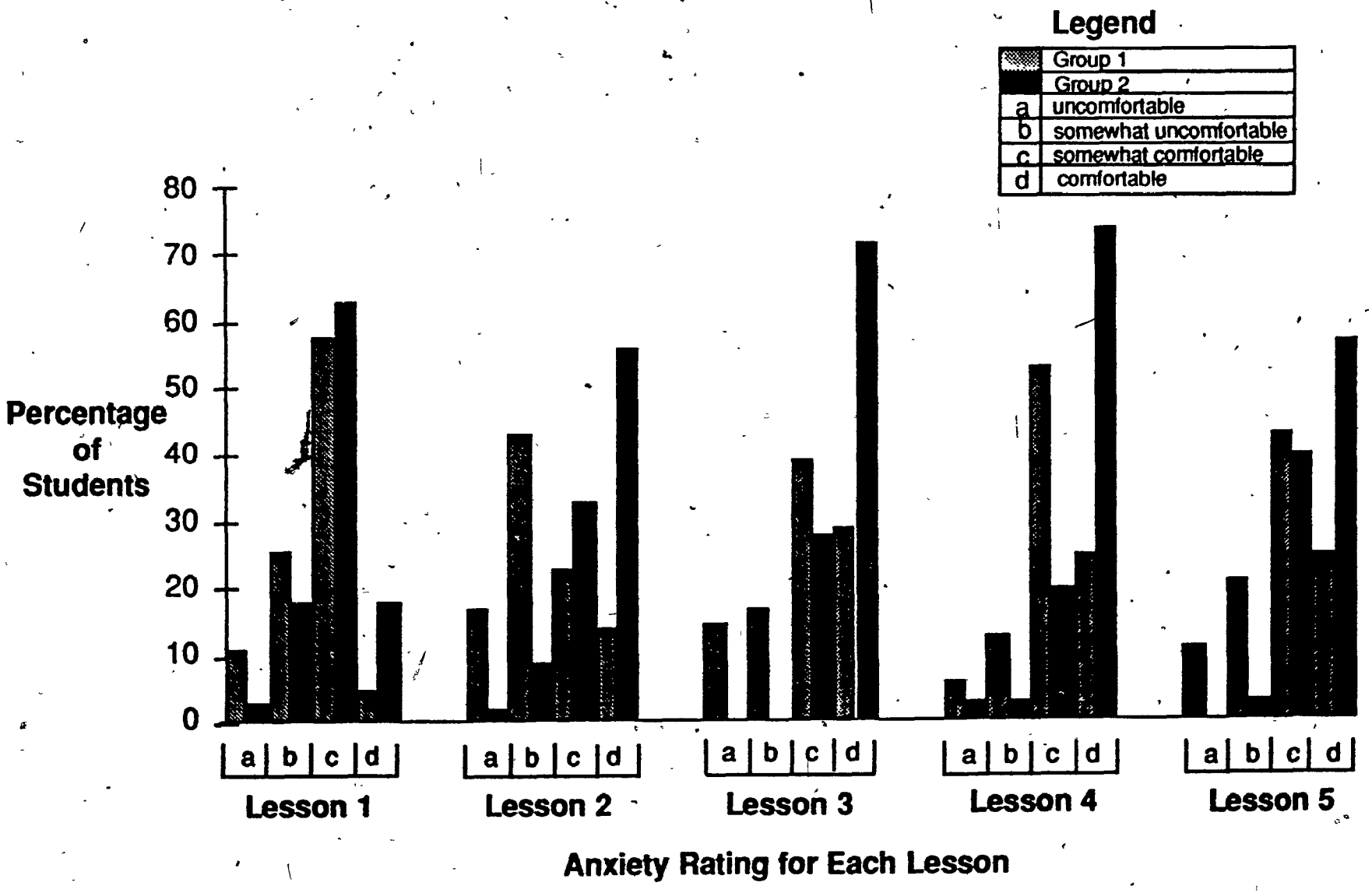
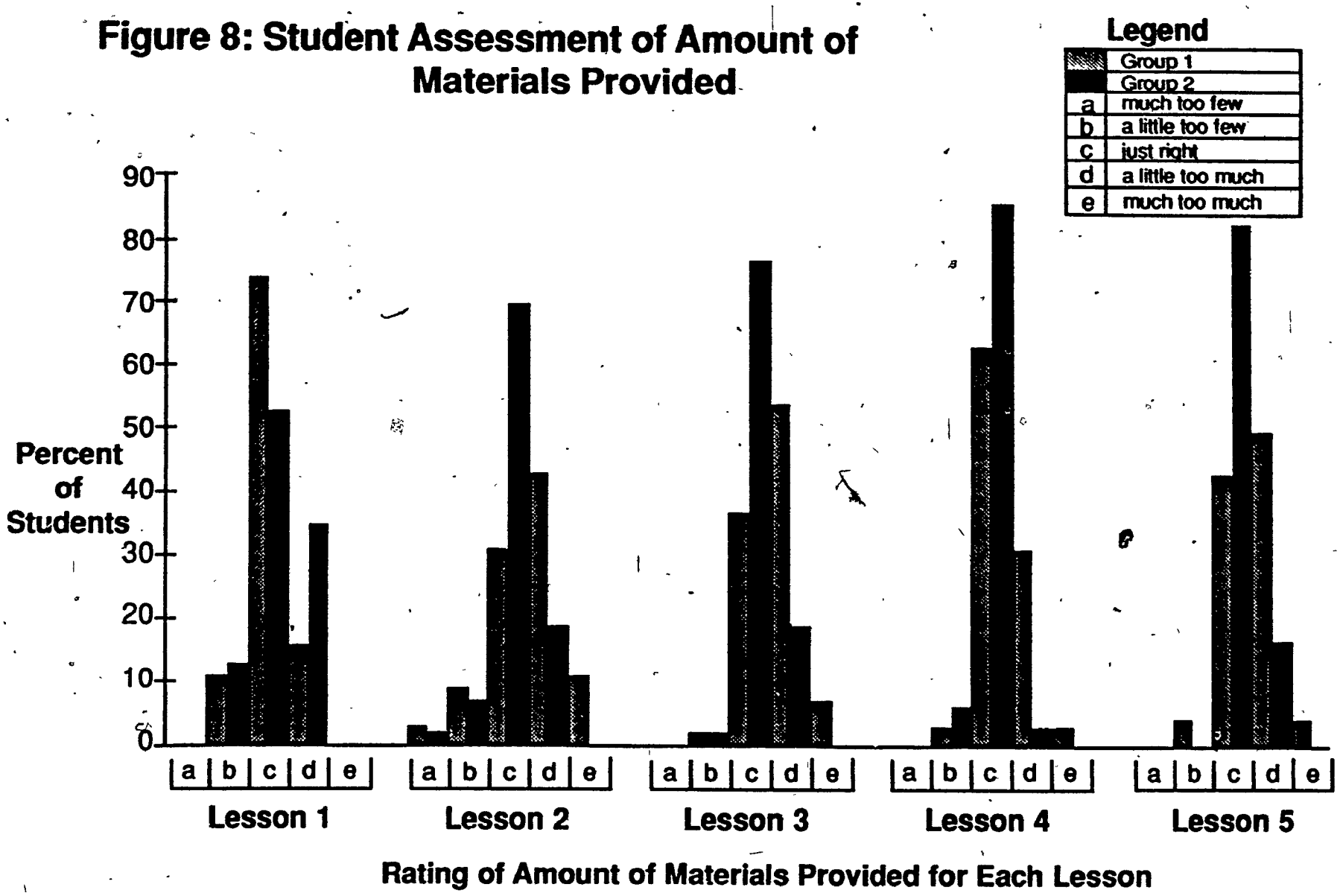


Figure 8: Student Assessment of Amount of Materials Provided



problems actually occurred. Where they did occur, areas of miscomprehension or difficulty were clarified by the instructor in written or verbal feedback, and revised by the students.

Evaluation of the Instructional Unit as a Whole

At the conclusion of the field testing phase, the students in the two treatment groups were requested to respond to a questionnaire, in which they rated their impression of the instructional unit as a whole. A copy of the questionnaire, entitled "Final Evaluation", appears in Appendix A. As explained earlier, this questionnaire required students to assess the overall, educational effectiveness of the unit, and to comment on their preference or non-preference for the cooperative group-based approach, as compared with a conventional, lecture-based approach. The students were also asked whether they would recommend the former instructional approach for future C210 students, and to comment on those aspects of the instructional unit from which they gained the most and the least.

For the sake of interest, a similar, but appropriately adapted questionnaire was administered to the control students (see Appendix A). These students were requested to rate the effectiveness of the conventional, lecture-based approach to which they had been exposed, and to comment on their preference or non-preference for this approach, as opposed to the cooperative group-based approach. Owing to the fact that the treatment and control groups were asked to evaluate two essentially different instructional appproaches, no attempt has been made to analyze statistically their respective responses. Furthermore, since the control group could only "hypothesize" about which of the two methods they would have preferred (without actually experiencing both), it was felt that the

control data regarding this issue did not merit analysis, statistical or otherwise.

An overall evaluation of the unit was also performed by the two C210 instructors at the completion of the five-week instructional period. The instructors' comments, combined with those of the students, and the evaluation data collected for each of the lessons, were used to make several revisions to the instructional unit as a whole.

Feedback from the Students

The educational effectiveness of the instructional unit. Figures 9 and 10 represent graphically the opinions of Group 1 and Group 2 students (respectively) regarding the overall, educational effectiveness of the instructional unit. Although not overwhelming, the evaluations received from Group 1 students tended to be more positive than they were negative. As evidenced in Figure 10, on every category but pacing, the majority of responses recorded by Group 1 students were in a positive direction. The majority notwithstanding, a substantial number of the students attested to having found the unit both unenjoyable and uninteresting. Moreover, as predicted, most of the students felt that the pacing of the unit was too rapid for them.

As expected, Group 2 students portrayed the educational effectiveness of the instructional unit as being extremely high. Every single student in Group 2 found the unit interesting, and relevant to their needs. In addition, all the students felt that they learned from the lessons. Only one student felt that the unit was poorly organized, while a mere handful did not find it enjoyable (see Figure 11). As in Group 1, most of the Group 2 students felt that the pacing of the lessons was too fast, but considerably more students in the latter group found the pacing appropriate, than did so in the former.

Figure 9: Evaluation of Instructional Unit: Group 1

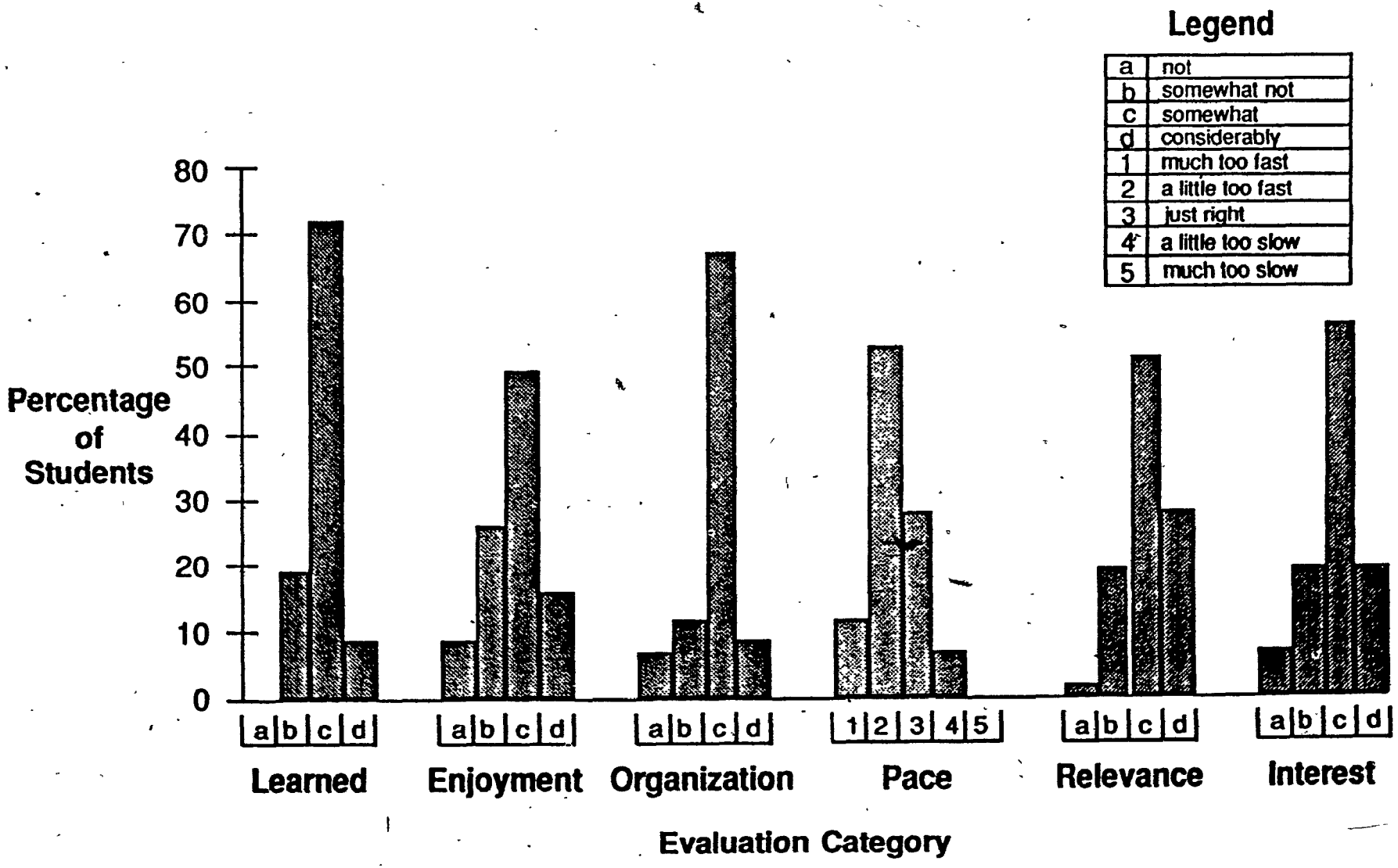
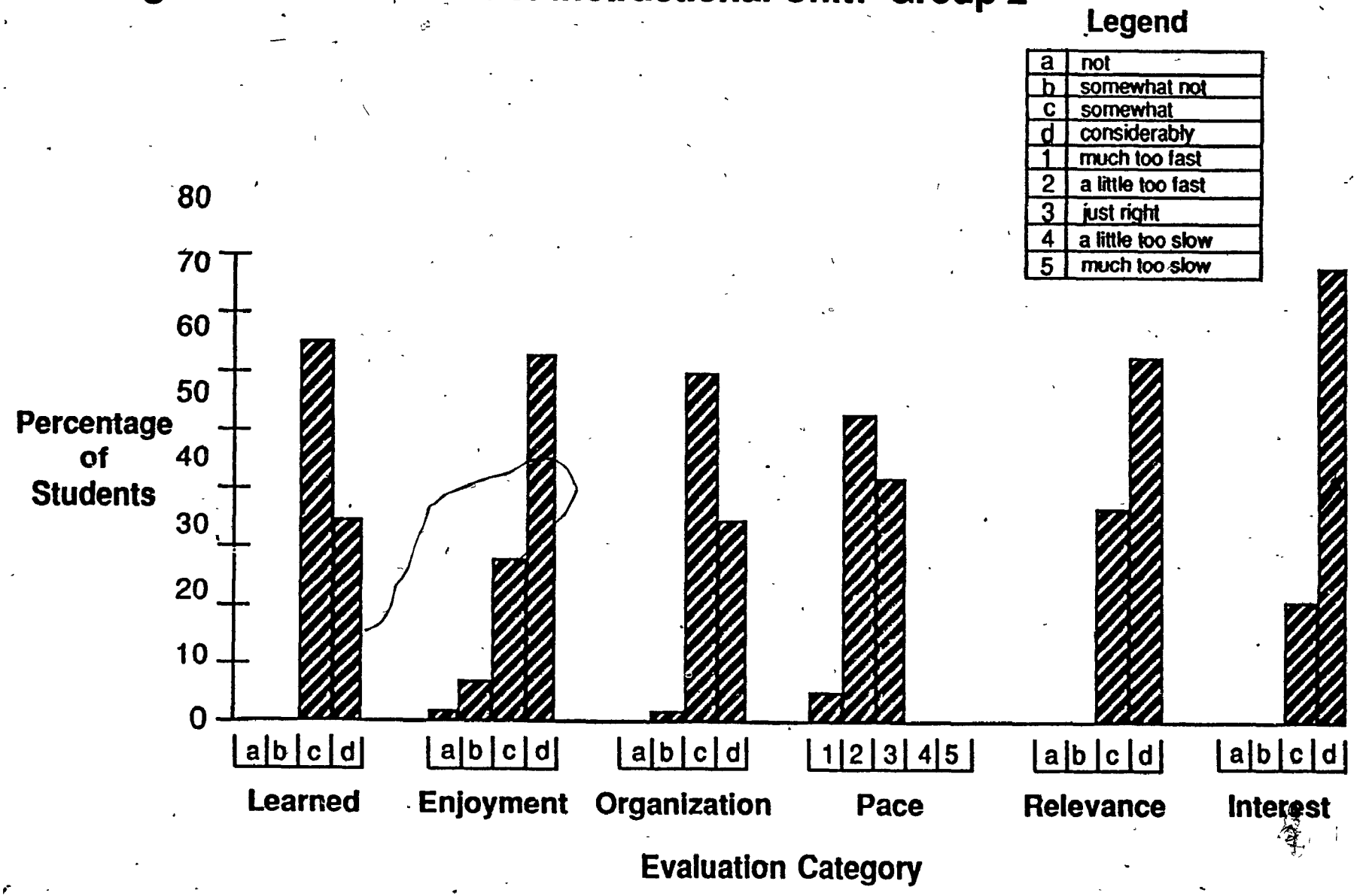


Figure 10: Evaluation of Instructional Unit: Group 2



Evaluation comments received from the control group reflected the fact that, on the whole, they felt satisfied with their lecture-based learning experience. It is interesting to note, that while the control group's comments tend to be somewhat more positive than those obtained for Group 1, they are also considerably less positive than those of Group 2. While the statistical significance of these differences has not been analyzed (for reasons explained above), given that the control group and Group 2 shared the same instructor, one might speculate that the relatively more positive evaluations received from Group 2 students suggest with favour the implementation of the instructional unit.

Preference for the instructional approach. The somewhat dissimilar opinions recorded by groups 1 and 2 regarding the educational effectiveness of the unit, were reflected in their statements concerning their preference for the instructional approach employed. As in the previous case, the opinions of Group 2 students tended to be relatively more positive than those of Group 1 students towards the cooperative group-based approach. The majority of Group 1 students felt that they would have learned more from a traditional lecture-based approach than they did from the cooperative group method. Despite this, most students believed that they would have performed no differently on the mid-term examination, and that their motivation, interest, and attendance would have been the same under either condition. Finally, the students in this group were more or less equally divided as to how the two approaches might affect their enjoyment of the classes, but a small majority maintained that they would have enjoyed the classes less, had a traditional lecture-based approach been used.

As for Group 2 students, the overwhelming majority felt convinced that they would have both learned and enjoyed the classes less, had lecturing been the strategy employed. Moreover, most of the students in Group 2 believed that

they would have been less interested and less motivated in a lecture-based instructional situation. Like the students in Group 1, however, the majority of those in Group 2 felt that their performance on the mid-term examination, and their attendance would have remained unaltered, regardless of the instructional strategy used.

Recommendation of the instructional strategy. Having experienced five weeks of a combined cooperative learning/ participation/advance organizer instructional strategy, students in the two treatment groups were asked whether they would recommend this type of learning experience for future students in C210. Once again, the two groups responded dissimilarly from one another, but this time, the difference in their opinions was extreme. In Group 1, only 49% of the students recommended the approach, while a full 33% felt that it would not be beneficial for future C210 students. 12% believed that a mixture of lecture and group-based strategies would be more appropriate, and 6% provided no answer to the question. In Group 2, on the other hand, 98% of the students recommended that the instructional strategy be used in future classes, while a mere 2% suggested that a combined lecture/group approach might be preferable. There were no students in this group who did not recommend the group-based instructional strategy.

The students in both groups provided a number of reasons as to why they would or would not recommend the instructional strategy in question. Those in Group 1 who supported its future use, felt that the approach increased motivation and interest, and that it was a refreshing change to the usual passive reception of lectures, that characterizes so much of school and university learning. Many found the approach enjoyable, and believed that they learned more through working with others. In addition, a substantial number of students noted that, due

to the fact that the subject matter was repeated and reviewed in small groups, as well as manipulated by the students themselves, it was easier to assimilate. A number of students also identified the fact that the jigsaw group learning/teaching strategy provided them with good practice for teaching. Finally, several students pointed out that the employed instructional strategy encouraged class members to get to know each other better, and allowed them to feel more part of the class than they had previously.

In addition to those reasons provided by Group 1 students, Group 2 supporters of the instructional strategy reported that the strategy taught them cooperation, helpfulness, and a number of communication skills. Many students even felt that they gained an increased sense of responsibility and confidence as a direct consequence of their participation in the classes. In terms of their cognitive gains, students in Group 2 felt that the approach encouraged them to prepare more for class, and forced them to keep up with the work covered therein. Moreover, the students believed that the group work in which they were involved provided clarification of those concepts poorly explained by the text book, and therefore enabled them to feel more confident about the mid-term examination. Group 2 students also felt that the approach had merit because it exposed them to an alternative teaching method, and allowed them to discover things about the teaching process itself.

The students in Group 1 who felt that they could not recommend the instructional strategy noted the following reasons: First of all, many believed that the major problem with the approach was that it delivered the responsibility of instruction to students, who did not know as much, nor expend as much effort as an instructor would have. Moreover, they considered that the group-based approach was not appropriate for university level students, and that it would have been better suited to elementary and high school pupils. The students also felt

that, given the amount of material that had to be covered in so short a time, an expository, lecture-based strategy would have been more appropriate than the small-group learning approach that was employed. Finally, a small number of students complained about the fact that not all group members worked as hard as others in the course of the five week instructional period, and that this made the experience unenjoyable for those who had to carry the brunt of the workload.

Strengths and weaknesses of the instructional unit. Students in Group 1 agreed unanimously that the single aspect of the learning experience from which they gained the most was the expert groups. These, they found enjoyable and enlightening, both from the point of view of content learned and social interaction. The students were equally unanimous in their assessment of the weaknesses of the instructional unit. As expected, pacing was a major problem area identified by the students in this group. Many recommended slowing down the pace of instruction. They also tended to disapprove of the group situations in which they had had to teach each other, as opposed to being taught by their regular instructor. The students reported that, due to the insufficient amount of time provided for these activities, they had felt so rushed that they had simply dictated information to one another, instead of teaching it. It is not surprising, then, that these students were of the opinion that the unit would have been more effective had some lectures been provided.

In direct opposition to this, students in Group 2 identified the unit's strength as lying in **both** the expert learning groups, **and** the teaching groups. They noted that both of these features of the instructional unit promoted cooperation with others, and exposed them to other students' points of view. Moreover, they felt that their participation in both group situations facilitated the repetition of the material to be learned, and this, they considered to be an

essential aspect of the unit's effectiveness. Unlike those in Group 1, the students in Group 2 appear to have particularly appreciated the group teaching situations, since these, they claimed, contributed greatly to their knowledge of teaching. Few of the students in Group 2 identified any weaknesses in the unit, but those who did, attributed any failures to the rushed pace of the lessons. They recommended that the pacing of the unit be slowed down. Many suggested, furthermore, that groups containing more than four members be avoided, and that a "teared" classroom not be used, since these elements tended to confound successful group work.

The opposing assessments received from the two groups of students helped to clarify, to some extent, an issue which had, up until this point, eluded the researcher. From the above assessments, it is clear that the activity from which Group 2 students seem to have gained the most (namely, group teaching), is the very same activity from which Group 1 students appear to have gained the least. As intimated in the evaluations received for each lesson, the rushed pace of the unit had a far more detrimental effect on Group 1, than it did on Group 2. Critically affected by this fact were the group teaching activities in Group 1; by the end of the five week instructional period, these had all but completely broken down, with group members being forced to dictate to one another as opposed to teaching each other. Is it any wonder, then, that the students in Group 1 found such group work to be both uninteresting and unenjoyable?

Feedback from the Instructors

At the end of the five week instructional period, the researcher met with the two C210 instructors to discuss their overall assessment of the unit. In the course of this meeting, the instructors discussed not only how they felt their students had responded to the unit, but also how they, as instructors, had coped

with the instructional strategies, materials and activities contained therein. In so far as their students were concerned, the instructors felt that the unit had been received extremely favourably by Group 2 students, but somewhat less so by Group 1 students. It was unanimously agreed that the greatest problem with the unit was its pacing; we had quite clearly set out to cover far too much material in the time available for instruction. It was obvious to all concerned that this problem would require considerable revision, before the unit could be used with future classes.

From their own perspective, the instructors noted that they had found it extremely difficult to coordinate the numerous handouts included in the unit. Since they greatly approved of these materials, they did not think that any of them should be omitted from the unit. Rather, it was suggested, a more manageable format for distributing the handouts should be found. Such a solution would also help to minimize the amount of time in each lesson that was occupied by material distribution. Finally, the instructors believed that, while appropriate for the initial field testing of the unit, the lengthy and somewhat verbose directions provided in the lesson plans would discourage future implementations of the instructional unit by other instructors. They suggested that the instructor's guide be revised, and thereby rendered more "user-friendly".

Changes to the Instructional Unit

In addition to the changes already suggested in this chapter, the following revisions should be made to the instructional unit:

Reduce pacing. There are a number of ways in which this may be achieved. One method would be to reduce the amount of content to be covered in the unit. The literature on cooperative learning and that on active/participative learning supports this approach. Smith (1986) and Charlesworth (1986) have

suggested that, before embarking on a programme of cooperative group work, instructors should "carve down" any content which is not deemed absolutely necessary. In the case of the present instructional unit, the instructors might choose, for example, to cut down on some of the baseline, verbal information that the students were expected to learn. One could argue that, in a survey course of this type, it is not really necessary for students to know explicitly the philosophies proposed by each one of the humanistic psychologists. Rather, they need only be thoroughly familiar with the overall philosophy that characterizes humanistic education. Similarly, an instructor might believe that it is not so important to cover all of the teaching applications suggested by each and every theory. Accordingly, he/she might decide to exclude from the unit all of the teaching applications, or, alternatively, simply cover them in less detail than suggested by the instuctional unit. Decisions as to what content to omit or include would depend entirely on the preferences of the instructor, and the goals that he/she designates as priorities. Hence, the responsibility of choosing what to omit from the unit should be left with each individual instructor.

Another method that would effectively reduce the pacing of the unit would be to leave the content as it is, and to extend the amount of time allocated for instruction. It is felt that the addition of a single week of instruction (i.e., one additional two-and-a-half-hour lesson) would sufficiently reduce the pacing of the unit.

An alternative approach would be to reduce the number of cooperative group activities included in the unit, and to replace some of the presently designated group activities with expository lectures. Since expository lectures allow for material to be covered in a much shorter time than can normally be accomplished in a group format, by replacing some of the group activities in the unit with lectures, one would effectively reduce the pacing of each lesson. This

approach of alternating group work with lectures is also supported in the literature. Smith (1986) has found that having one group-based class and one lecture-based class per week, creates a comfortable learning environment for both the learners and the instructor.

Finally, another way of reducing pacing would be to transform the in-class, expert group activities into out-of-class, individual homework assignments. What this would mean is that, instead of becoming experts on their respective topic areas by way of the in-class, expert group activities, students would be expected to go home at the end of each lesson, and individually research their assigned topics. Effectively, this would open up a considerable amount of classtime, and provide ample time in which to carry out the peer tutoring portion of the Jigsaw strategy. While this approach would, no doubt, be successful in reducing the pace of the unit, one argument against its adoption lies in the high evaluations received from students for the expert group learning activities, during the field testing phase of the project. It seems somewhat counter-intuitive to eliminate an activity that has been shown so conclusively to be successful with students. Nevertheless, the above approach is an alternative that should be considered by future instructors who implement the instructional unit.

It is felt that any of the above-noted approaches for reducing pacing would be appropriate for future users of the instructional unit. Preference for one approach over another depends, quite simply, on how well each conforms to the specific goals and concerns of the instructor, the nature of the students, and the flexibility of the time available for instruction. For example, one instructor may feel that she can afford to spread the length of the unit over a six week period, while another might believe that five weeks is more than enough time to devote to three learning theories. Consequently, the researcher considers it expedient to include all of the above suggestions in an introductory chapter to the

instructor's guide. In this way, future instructors will be able to consider all of the alternatives available to them, and select the one that is best suited to their particular needs.

Create hand-out package. In order to facilitate the coordination of all the student hand-outs employed in the unit, it has been decided that a student "hand-out package" should be created. The hand-out package will consist of all the group task, product, and process sheets required by each home group, for the entire duration of the instructional unit. The sheets will appear in the order that they are needed, so that hand-outs for each consecutive lesson will be grouped together. The hand-out packages should be distributed to each home-group during the first instructional session. After this time, it should be the responsibility of delegated group members to bring the packages with them to each class. At each lesson, the instructor should have available additional copies of the hand-out packages, in case a group member should forget to bring their group's package to class. It is felt that the student hand-out packages will not only facilitate matters for the instructors, but will also minimize the amount of time wasted on materials distribution.

Modify layout of instructor's guide. In an effort to make the instructor's guide more attractive and user-friendly, it has been decided that the layout of the lesson plans should be completely revamped. For each activity, a short and concise description will be written in point form, with the required time and materials precisely specified. It is hoped that the addition of more headings and bold letterfaces will allow future instructors to follow the progression of the activities more easily. In addition, the revised instructor's guide will simply designate lecture and discussion topics, without providing detailed descriptions of

what precisely should be said by the instructor. It is felt that instructors should have an adequate knowledge of the content areas addressed in the unit, and that there is therefore no need to provide them with additional background information.

Additional concerns. Although already stated in the original instructor's guide, there appears to be a need to emphasize the suggestion to avoid the formation of groups larger than four people. Also stressed should be the fact that instructors should attempt to hold their lessons in classrooms which facilitate group work. We discovered through the field testing of the unit that, while it is possible to carry out successful group learning activities in a teared classroom, it is not desirable.

Finally, it should be noted that a number of additional modifications have been suggested for the instructional unit, as a consequence of the experimental results obtained in the present study. These modifications are addressed in the final chapter of this thesis.

CHAPTER 5

Experimental Results

Introduction

In this chapter, the results of the cognitive, affective and sociometric data analyses are presented. Two cognitive measures were analysed: a measure of achievement, taken before the start of the instructional unit; and an achievement post-test, administered after the treatment period had ended.. The prior achievement measure was used as a covariate in one-way analysis of covariance, with the post-test measure serving as the dependent variable.

The affective data are of two types: The first is a measure of attitudes toward cooperative learning, administered to all subjects both pre- and post-treatment. The second type is a measure of cooperative group skills, also administered both before and after treatment, and containing subjects' assessment of themselves on 13 cooperative skills. In order to analyse the first measure, the 16-item pre-test was subjected to principle components analysis. This was done to reduce the items to a more manageable set of variables. Items loading on the resultant three major factors were analyzed using MANCOVA. In this analysis, the pre-test was used as a covariate, while the post-test served as the dependent variable. Discriminant functions analysis was then carried out to identify the source of the between-group differences. The second affective measure - comprising the13-item inventory of cooperative learning skills - was treated as a homogeneous set, and analyzed by way of a two-way mixed ANOVA. The sociometric data also had two components: a measure of each subject's sociometric status and a test of their emotional expansion. Each was analysed separately, from pre to post, using sign tests.

Note: In all of the statistical analyses undertaken, unless otherwise specified, alpha was set at .05.

Cognitive Measures

The cognitive post-test scores were analyzed by way of a one-way analysis of variance, using prior achievement as a covariate. The results of the ANCOVA are summarized in Table 3, and the means and standard deviations are presented in Table 4. From the ANCOVA output table, it appears that no significant between-group differences were found for cognitive achievement, $F(2, 127) = 2.923$, $p > .05$.

Table 3: Results of ANCOVA on Cognitive Post-test

Source	SS	df	MS	F	p
Covariate (prior ach.)	541.83	1	541.83	53.44	.001
Main Effects (group)	59.28	2	29.64	2.92	.057
Explained	601.10	3	200.37	19.76	.001
Residual	1287.60	127	10.14		
Total	1888.70	130	14.53		

In the correct application of ANCOVA, it is necessary to perform an analysis of homogeneity of regression. Since ANCOVA employs a single within cells regression coefficient to adjust all cell means, it carries with it the assumption that all of the individual cell regression lines are parallel (within error). It is precisely this parallelism that the test for homogeneity of regression seeks to verify. Due to the fact that the test for homogeneity of regression calls

Table 4: Mean Scores and Standard Deviations for Cognitive Post-test and Prior Achievement

Groups	n	M	SD
		Post-test	
Coop 1	47	28.13	4.06
Coop 2	43	27.53	3.74
Control	41	29.88	3.23
		Prior Achievement	
Coop 1	47	67.11	10.19
Coop 2	43	63.80	11.60
Control	41	68.75	11.05

for a testing of the inverse hypothesis (i.e., a research hypothesis which states that there are no differences), it follows that a more conservative alpha level than is normally adhered to should be set (Keppel,1982). Thus, an alpha level of .25 (standard for this type of test) was delineated. A violation of homogeneity of regression was detected, implying that the relationship between the covariate and the dependent variable was different for the three treatment groups $F(2,125) = 2.32$, $p < .25$. In this situation, an interpretation of the main effects for ANCOVA is inappropriate, and an understanding of the locus of the interaction should be attained (Cronbach & Snow, 1977). Post hoc comparisons of the slopes of each group revealed that the slope of Group 2 was significantly

different from that of the other two groups collapsed $F(1, 126) = 4.54$, $p < .05$. Table 5 provides a summary of the results obtained for the test of homogeneity of regression. The individual regression lines for each of the three experimental and control groups are graphed in Figure 11. It is clear from this analysis that the combined instructional strategies differentially affected low, middle and high achievement learners in Group 2, but not in the other two groups. More specifically, lower learners in Group 2 performed as well on the posttest as middle-level learners, unlike their counterparts in the other two groups, who performed differentially. From the formative evaluation data reported earlier, we know that it was in Group 2 that the instructional strategy was most successfully implemented. Affective data results to be presented shortly will further confirm this interpretation.

Correlations of prior achievement with post-test scores, obtained for each group, also confirmed the above findings. Table 6 shows that these two measures were highly intercorrelated for Group 3 (the control condition), with as much as 50% of the variance being accounted for. Group 1 exhibited a somewhat lower, but nevertheless fairly strong, correlation, with 33% of the variance being explained, while in Group 2, a weak correlation of .33 was associated with the two measures, and only 11% of the variance explained. This weak correlation between prior achievement and post-test scores is predicted in several studies involving the two sigma challenge (e.g., Burke, 1983; Tennenbaum, 1982). Under this condition, prior achievement becomes a less influencial determinant of summative achievement than does the nature of the instruction. As a result, "lower" students are observed to perform better, while "higher" students continue to perform well.

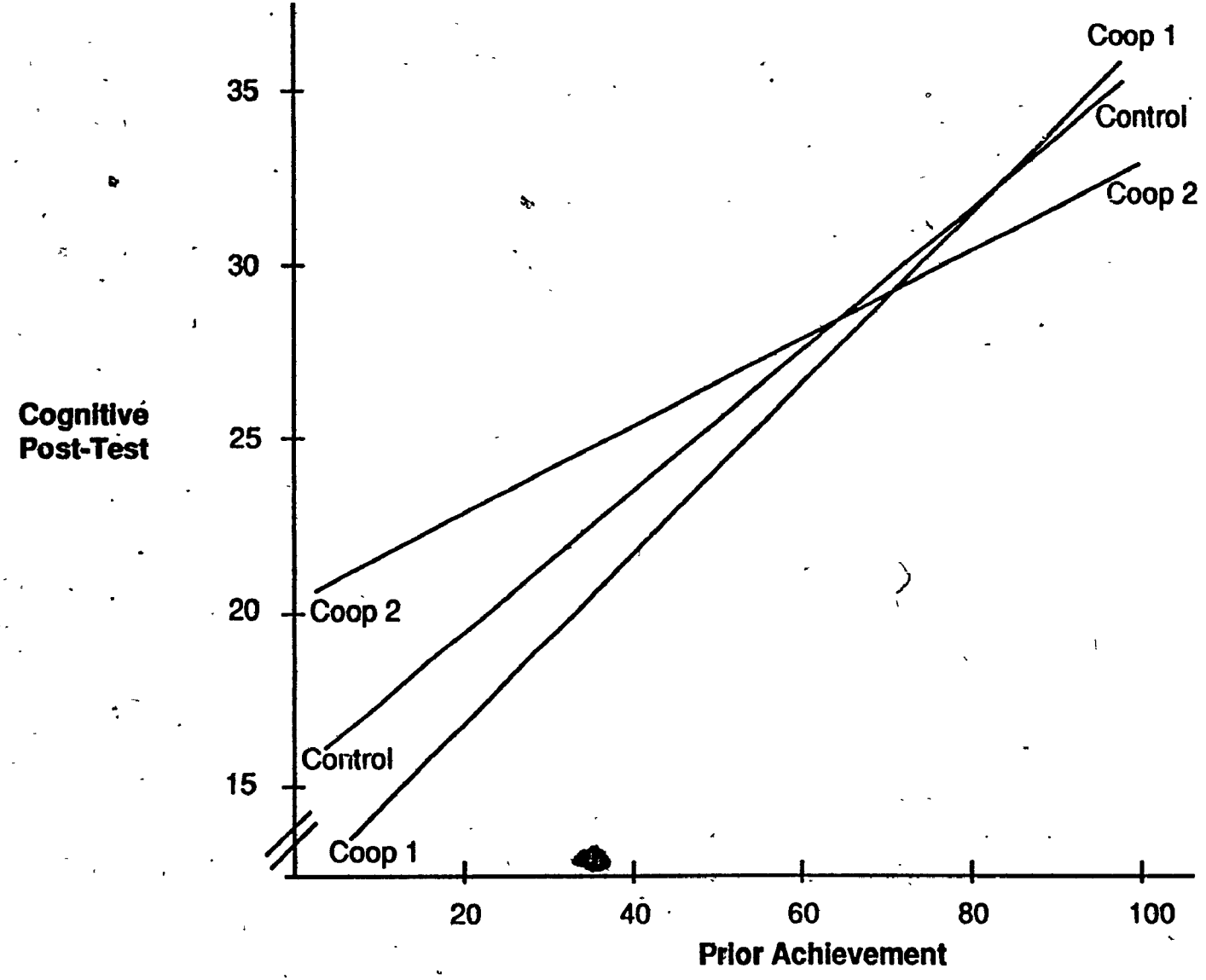
Table 5: Analysis of Covariance with Test for Homogeneity of Regression

Source	SS	df	MS	E	p
Treatments	59.30	2	29.65	2.92	.06
Covariate	476.58	1	476.58	47.00	.01
Error	1287.74	127	10.14		
Interaction of Covariate X Treatment	46.04	2	23.02	2.32	.10
Error	1241.70	125	9.93		
Group 1 vs. Groups 2 & 3	19.40	1	19.40	1.93	.17
Error	1268.34	126	10.07		
Group 2 vs. Groups 1 & 3	44.79	1	44.79	4.54	.04
Error	1242.95	126	9.86		
Group 3 vs. Groups 1 & 2	6.50	1	6.50	.64	.42
Error	1281.24	126	10.17		

Table 6: Correlation of Prior Achievement and Post-test Score

Group	r	p	r^2
Coop 1	.58	.01	.33
Coop 2	.33	.02	.11
Control	.71	.01	.50

Figure 11: Between Group Regression of Cognitive Post-Test on Prior Achievement



Affective Measures

As noted above, there were two affective measures analysed in the present study. The first assessed subjects' attitudes towards cooperative group work, while the second was a measure of subjects' ability in 13 cooperative skills.

Cooperative Group Work

Subjects' attitudes towards cooperative group work were analyzed in three steps. These three steps, comprising principle components analysis, multiple analysis of covariance (MANCOVA), and discriminant functions analysis, aimed to uncover any between-group differences in students' attitudes towards cooperative group work that resulted from the various treatments. It was first of all decided that, since the test might include different aspects of attitudes towards cooperative learning and interaction, it should not be treated as a homogeneous set. In order to reduce these 16 items to homogeneous sub-sets of the original instrument, principle components analysis was performed on the pre-test. This was done because the pre-test was presumed to be free of treatment effects. For the ease of the reader, the original 16 items included in the analysis are listed below:

Q. 1	Students learn more from working together than alone.
Q. 2	Students can learn as much from each other as from a teacher.
Q. 3	Group grades are an unfair method of student evaluation.
Q. 4	It is important for teachers to know how to cooperate.
Q. 5	Competition in the classroom motivates students to work harder.

Q. 6	In an assignment, two heads are better than one.
Q. 7	In the real world, people have to compete more than they have to cooperate.
Q. 8	The best students will get lower grades for group work than for individual work.
Q. 9	If students didn't have to compete, they wouldn't work as hard.
Q. 10	Group work is more enjoyable than lectures.
Q. 11	Working with others is an important skill which should be taught at schools and universities.
Q. 12	Group work is not appropriate for university students.
Q. 13	Group grades are an inaccurate measurement of work done by each individual.
Q. 14	Group work enables more work to be accomplished in a short time.
Q. 15	Group work decreases each student's work load.
Q. 16	In group work, a few students end up doing the bulk of the work, while others do little or nothing.

The results of the principle components analysis show that 12 of the 16 items included in the analysis loaded highly on three major factors (see Table 7). An interpretation of the three factors was carried out by attempting to associate conceptually homogeneous items in each separate factor. The first of the three factors appeared to address the pros and cons associated with group work, while the second concerned the practical aspects involved in the application of cooperative learning. Finally, the third factor appeared to assess, more generally, the notions of cooperation and competition.

Table 7: Principle Components Analysis of 16 Item Attitudinal Pre-Test

	Factor		
Item	1	2	3
Q. 1	.54		
Q. 3	.58		
Q. 4			- .67
Q. 5			.50
Q. 6			-.54
Q. 8	.57		
Q. 9		- .55	
Q. 10	.50		
Q. 11		.56	
Q. 14		.61	
Q. 15		.50	
Q. 16	.57		

Three attitudinal sub-tests were created by adding together responses within each of the three factors. This is legitimate in light of the strength of the first three factors (Factor 1, eigenvalue = 2.54, R^2_c = 15.89; Factor 2, eigenvalue = 2.15, R^2_c = 13.45; Factor 3, eigenvalue = 1.54, R^2_c = 9.63). Between-group differences in post-test scores were then analysed by way of MANCOVA, with the pre-test serving as a covariate, and the post-test being used as the dependent variable. The unadjusted means and standard deviations involved in this analysis are provided in Table 8. The multivariate test for homogeneity of regression indicated that the assumption of homogeneity of regression had been satisfied $F(18, 264) = 1.17$, $p > .25$. In addition, the test of the set of all three covariates combined into a single covariate (i.e., the average correlation) was found to be significant $F(27, 270) = 3.25$, $p < .01$. These two results served to validate the appropriateness of the chosen covariates. Finally, the MANCOVA

revealed that there was a significant main effect for Group $F(6, 174) = 5.12$, $p < .05$. Inspection of the dimension reduction analysis in MANCOVA revealed that only one of the two potential vectors significantly accounted for group differences $F(6, 172) = 5.59$, $p < .01$. This vector accounted for 99.78% of the explained variation ($R_c = .55$, $R^2_c = .30$). For this reason, the three dependent measures were considered a multivariate set, and the univariates were ignored.

Table 8: Attitudes Towards Cooperative Group Work: Mean Scores and Standard Deviations

Factor	Group	n	Pre-test		Post-test	
			M	SD	M	SD
Factor 1	Coop 1	35	15.20	3.54	14.69	4.06
	Coop 2	33	15.91	2.95	17.12	2.72
	Control	32	14.00	4.34	12.38	3.79
Factor 2	Coop 1	35	14.63	2.43	14.77	2.47
	Coop 2	33	15.30	2.51	15.09	2.34
	Control	32	14.47	2.38	14.34	2.15
Factor 3	Coop 1	35	11.34	1.57	11.86	1.59
	Coop 2	33	11.91	1.28	12.24	1.31
	Control	32	11.69	1.28	11.34	1.31

Follow-up analysis of the multivariate treatment effects were conducted in discriminant functions analysis. Table 9 shows the results of the discriminant functions analysis. A significant difference was found between the post-test multivariate means (i.e., group centroids) of Group 2 (Coop 2) and those of Group 3 (Control) $F(6, 58) = 5.31$, $p < .01$. By examining the univariate post-test

means, one may conclude that, after treatment, subjects in the second cooperative group exhibited significantly higher attitudes towards cooperative group work than did their counterparts in the control condition. Significant differences were also found between the combined post-test means of the two cooperative groups (Coop 1 and Coop 2), and those of the Control group $F(6, 93) = 3.27$, $p < .01$. Once again, subjects in the two cooperative groups were observed to exhibit more positive attitudes towards cooperative group work than did subjects in the control condition. No significant differences were found, however, between Group 1 and Group 3 (Coop 1 vs. Control), nor between the two cooperative groups (Coop 1 vs. Coop 2).

Table 9: Discriminant Functions Analysis: Attitudinal Data

Comparison	df	F	p	Subjects Classified Correctly
Coop 1 vs. Coop 2	6, 61	1.74	.13	69.12%
Coop 1 vs. Control	6, 60	1.23	.30	70.15%
Coop 2 vs. Control	6, 58	5.31	.01	78.5%
Coop 1 & 2 vs. Control	6, 93	3.27	.01	73.%

Cooperative Group Skills

With regard to the second affective measure, the13-item inventory of cooperative group skills was treated as a homogeneous set, and analyzed by way of a two-way mixed ANOVA. For this analysis, Group served as the between factor, while Time was the within (repeated measures) factor. In the ANOVA, a significant two-way interaction for Group and Time was detected

$F(2, 93) = 3.87$, $p < .05$. A main effect was found for Time $F(1, 93) = 52.42$, $p < .01$, but there was no significant main effect found for Group. The results of the ANOVA are summarized in Table 10. The means and standard deviations are shown in Table 11, and the means expressed graphically in Figure 12.

Table 10: Results of Two-Way Mixed ANOVA for Cooperative Group Skills

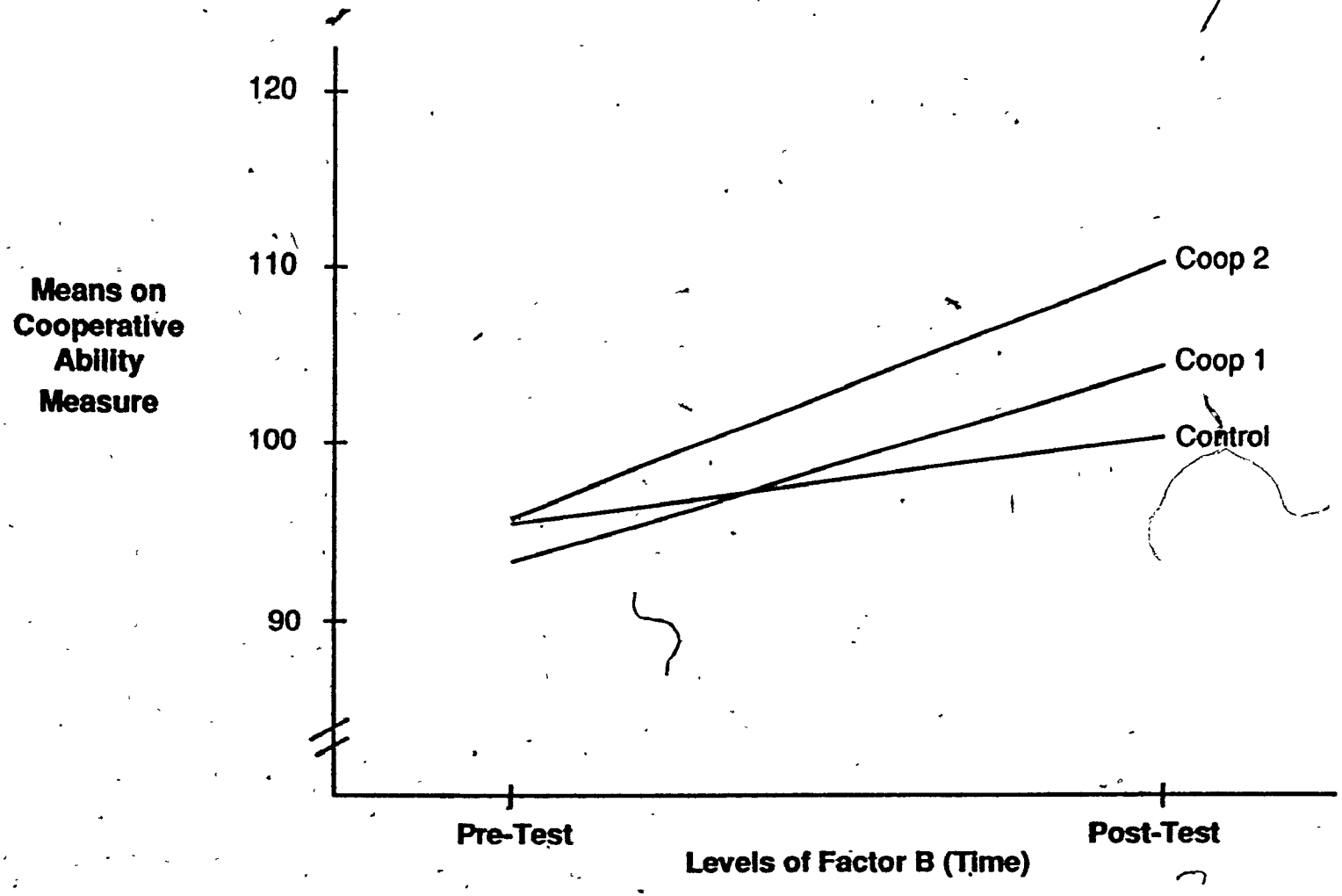
Source	SS	df	MS	F	p
Group	1109.87	2	554.93	1.65	.20
Error (S/A)	31294.50	93	336.50		
Time	5094.49	1	5094.49	52.42	.01
Group X Time	752.58	2	376.29	3.87	.02
Error (B X S/A)	9038.67	93	97.19		

Table 11: Mean Scores and Standard Deviations for Cooperative Skills

Groups		n	Pre-test	Post-test
Coop 1	M	33	93.48	104.15
	SD		17.30	12.72
Coop 2	M	31	95.97	110.97
	SD		16.06	12.14
Control	M	32	95.31	100.56
	SD		12.91	16.31

Note: Harmonic n = 31.98

Figure 12: Means Attained on Cooperative Ability Measure as a Function of Treatment Group and Time



The detection here of a significant interaction renders an interpretation of the main effects inappropriate, and any further analysis must seek the locus of the interaction (Cronbach & Snow, 1977). Post hoc analysis of simple main effects, using the Tukey procedure, revealed that the means of the two treatment groups (Coop 1 and Coop 2) differed significantly across the two testing times (i.e., pre and post). In both cases, post-test scores were significantly higher than pre-test scores, $F(1, 93) = 18.73$, $p < .05$, and $F(1, 93) = 37.02$, $p < .05$ respectively. Using the Tukey procedure, differences detected in the pre- and post-test means of the control group did not reach statistical significance , and judgement regarding changes over time in the cooperative skills of this group was therefore suspended.

Significant between-group differences were detected among the means of the three groups on the post-test $F(2, 186) = 4.12$, $p < .05$, but not on the pre-test. Further post-hoc analysis using the Tukey procedure showed that when studied individually, only the second of the two cooperative groups (Group 2) attained significantly higher scores than the control group on the post-test $F(1, 186) = 7.99$, $p < .05$. No significant differences were detected, however, between the post-test scores of the first cooperative group and those of the control group. There were also no significant differences found between the post-test scores of the two cooperative groups. When studied in combination, the two cooperative groups together exhibited higher post-test scores than the control group $F(1, 186) = 4.82$, $p < .05$. However, using the Scheffe procedure, this difference did not reach statistical significance, and judgement was therefore suspended.

Sociometric Measures

Two sociometric measures were analyzed: Changes in sociometric status (i.e., social acceptance), and changes in subjects' emotional expansion.

Differences in pre- and post-test scores on both measures were analyzed by way of sign tests. Subjects in both Group 1 (n = 48) and Group 2 (n = 44) exhibited significant increases in sociometric status, chi squared = 4.9, $p < .05$, and chi squared = 6.4, $p < .05$ respectively. The number of "isolates" (i.e., people unchosen) dropped from 11 on the pre-test, to six on the post-test for Group 1, and from 13 to six for Group 2.

A similar increasing trend was found for the emotional expansion measure. Subjects in both groups exhibited significant gains in emotional expansion, chi squared = 13.76, $p < .05$ for Group 1 (n = 33), and chi squared = 19.6, $p < .05$ for Group 2 (n = 32). From these results, we can conclude that exposure to the systematically designed instructional unit affected substantial gains in subjects' sociometric status and emotional expansion.

CHAPTER 6

Discussion

Introduction

In this final chapter, an interpretation of the results obtained from the field testing of the instructional unit is presented. Each of the cognitive, affective and sociometric outcomes of the study is explained, and reference to how these results tie in with those derived from the formative evaluation is made. An attempt is then made to explain the outcomes of the project, with an emphasis placed on those outcomes which run counter to the hypotheses of the study. Several problem areas are identified in this section, and directly associated with the specific shortcomings of the project. Finally, a number of conclusions are drawn regarding the overall project, and guidelines for future projects recommended.

Interpretation of the Results

Cognitive Outcomes

The primary question being asked in the present study was whether students, exposed to the combined cooperative learning/student classroom participation/advance organizer instructional strategy, would achieve significantly different cognitive post-test scores from those obtained by unexposed students, and whether these scores would exceed by two sigma those of the control group. From the results reported in Chapter 5, it may be concluded that the cognitive post-test scores observed for the two treatment conditions did not exceed by two sigma the cognitive post-test scores of the control group. That is not to say, however, that the combined instructional strategy did not influence cognitive learning whatsoever. Rather, it influenced the exposed students differentially.

While high, medium, and low learners in Groups 1 and 3 (Coop 1 and Control respectively) achieved post-test scores in keeping with their previously established ability levels, the lower learners in Group 2 were observed to perform as well as the middle-level learners in their group. This suggests that the instructional treatment benefited the lower learners in the second treatment group. The weak correlation detected between prior achievement and post-test scores for Group 2 makes it clear that, in this group, the experimental treatment exerted a stronger influence on summative achievement than did student aptitude.

The obvious question to ask, of course, is why the results obtained for the two treatment groups are not consistent, especially since both groups were supposed to be treated in essentially the same way. The answer to this question may be found in the formative evaluation of the instructional unit. In Chapter 4, it was noted that, as a consequence of inappropriate pacing, the instructional strategy all but totally broke down in Group 1. In Group 2, on the other hand, the inappropriate pacing of the unit, while problematic, did not have as severe nor detrimental an effect on the instructional strategy as it did in Group 1. It is not surprising, then, that in Group 2 (where the instructional unit was most "correctly" applied), a positive effect on cognitive learning was detected, while in Group 1, the students were found to perform no better than their counterparts in the control group.

Another possible reason for the differential cognitive post-test performances of the two treatment groups may lie in teacher effects. It should be recalled that, while Group 2 had the same instructor as the control group, the two experimental groups had different instructors. Hence, while one can be certain that differences in the performance of the second treatment group and the control group are as a result of the treatment itself, any differences detected between the

two treatment groups, or between Group 1 and the control condition, may, quite possibly, be as a result of teacher differences.

Affective Outcomes

Both of the affective measures included in this study appear to have been positively affected by exposure to the instructional unit. First of all, in so far as the promotion of positive attitudes towards cooperative group work is concerned, the instructional unit may be considered to have been a success. From the results obtained for this measure, it is evident that the post-treatment attitudes of the two experimental groups combined were more positive than those of the unexposed (control) students. When studied individually, the post-treatment attitudes of Group 2 students towards cooperative learning were found to be more positive than those of the control group, but those of Group 1 did not exceed sufficiently those of the control condition to reach statistical significance. Here, as with the cognitive data, the somewhat less positive results obtained for Group 1, as compared with Group 2, are consistent with the formative evaluation findings. In the formative evaluation of the instuctional unit, it was noted that students in Group 2 tended to display more positive feelings towards the unit (and the aspect of cooperative group work contained therein) than did students in Group 1. It should be noted, however, that the observed differences in the post-treatment attitudes of the two experimental groups did not reach statistical significance, suggesting that the instructional unit did, in fact, exert some positive effect on the attitudes of Group 1 students, but did not do so to the extent that their attitudes differed significantly from those of the control group.

The instructional unit was also found to exert a positive influence on the second affective measure, by which students' perceived abilities in 13 cooperative skills were assessed. The cooperative ability assessments of the

two treatment groups were found to increase significantly over the treatment period, while those of the control group were observed to rise somewhat, but not sufficiently to reach statistical significance. These results suggest that the cooperative ability of those students exposed to the instructional unit improved, whereas those of the unexposed students did not.

Prior to treatment, all three groups were found to be statistically equivalent in their perceptions of their respective cooperative abilities. This was not, however, the case following treatment. A comparison of the post-treatment ability assessments obtained for each group revealed that the assessments of Group 2 students significantly exceeded those of the control group. It may therefore be concluded, that the instructional unit succeeded in increasing the perceptions of Group 2 students regarding their cooperative abilities. Concerning Group 1 students, however, the instructional unit was a little less effective. Although a significant increase in cooperative ability was found for this group across the two testing times, an examination of subjects' post-treatment scores revealed that their perceived cooperative abilities did not compare particularly favourably with those of the control group. As with their attitudes towards cooperative learning, Group 1 students did not display significantly higher cooperative skill assessments after treatment, than their control group counterparts. Also in keeping with the results of the former measure, the post-treatment ability assessments of the two experimental groups did not differ significantly. Unlike in the former measure, however, judgement had to be suspended as to whether the scores of the two treatment groups combined were significantly higher than those of the control group. That is to say, it was not possible to conclude with any certainty whether the post-treatment cooperative skill assessments of the combined experimental groups significantly exceeded those of the control condition. What is certain, nevertheless, is that following

exposure to the instructional unit, Group 2 students displayed more positive perceptions regarding their cooperative skills than did their unexposed (control) counterparts. Furthermore, although the post-treatment cooperative skill assessments of Group 1 students were not significantly higher than those of the control group, the overall cooperative skill assessments of the former were observed to improve over time, whereas those of the latter were not. These results are evidence of the positive effect that the instructional unit exerted on students' cooperative skills.

Once again, the somewhat more favourable results obtained for Group 2 students , as compared with those for Group 1, are consistent with the outcomes of the formative evaluation. Given the more severe administrative and attitudinal problems experienced by Group 1 (see Chapter 4), it is not at all surprising that students in this group appear to have gained less from the instructional unit than did students in Group 2.

Sociometric Outcomes

In both treatment groups, students' sociometric status and emotional expansion scores were found to improve as a result of exposure to the instructional unit. This suggests that students not only came to know each other better, but also became increasingly more receptive to working and socializing with each other. Not surprisingly, therefore, it was found that fewer students were isolated or "outcast" following exposure to the instructional unit, than were so prior to exposure. It seems clear that, by causing students to work together in groups, the implemented cooperative/participative/advance organizer instructional strategy effectively increased social interaction among class members.

As with the cognitive and affective data, the results of the sociometric data analysis are consistent with feedback received from the formative evaluation of

the instructional unit. In their written evaluations of the unit, students in both treatment groups attested to the fact that, by the end of the instructional period, they felt more accepted by their classmates, and knew more people, than they had six weeks earlier. Even those students who displayed somewhat negative attitudes towards the instructional unit, appeared to have appreciated the increased social interaction that the unit afforded them. Quite clearly, then, the instructional unit was successful in enhancing social interaction among class members.

Explanation of Project Outcomes

To a great extent, the affective and sociometric outcomes hypothesized at the outset of the present study were achieved. As for the cognitive results, however, those obtained were not predicted at all by the research hypotheses proposed in the study. The central hypothesis of the study (i.e., that the post-test score of the average treated student would be two sigma above that of the average control student) was not achieved, nor even approximated. Even the trend of the attained cognitive outcomes runs counter to the expected pattern of results: It appears that the obtained results more closely resemble an aptitude by treatment interaction, than they do an overall gain by all students.

There are several possible reasons why the hypothesized cognitive outcomes of the project were not realized. Some of these reasons are related to problems within the instructional design itself, while others concern the choice of the combined instructional strategies. A number of uncertainties surrounding the question of Bloom's "two sigma" theory may also have contributed to the somewhat disappointing cognitive results. Finally, several problems associated with the practical implementation of the instructional unit are believed to have adversely affected the project outcomes. Each of these problem areas is discussed below.

Problems in the Instructional Design

Inappropriate pacing. From the results of the formative evaluation, it is clear that the instructional potency of the designed unit was severely minimized by the inappropriate pacing which characterized it. In almost every lesson, there was insufficient time provided to the students to allow them to integrate sufficiently the material that they were learning. As a result, the group-based learning activities became essentially product-oriented, as opposed to process-oriented, since an unintended emphasis was placed on completing the task, rather than on learning from it. In many cases, the students were not even able to carry out the essential elements of cooperation and participation, so rushed were they for time. In Group 1, for example, several instances were reported where students found it necessary to dictate answers to one another, as opposed to teaching each other. Consequently, one of the most important cognitive strengths associated with cooperative learning (namely, the clarification of concepts through oral review and explanation to others (Kohn, 1987)) was effectively eradicated. As for the instructors, they too struggled with the time constraints which hindered each lesson. In Group 1, the instructor even found it necessary to omit some of the essential advance organizers, in an attempt to cover other planned activities.

It is felt that the lack of time which marked the instructional unit, was extremely detrimental to the achievement of the desired cognitive outcomes of the project, and particularly so in Group 1, where added administrative burdens aggravated an already inappropriate time allocation. Although an attempt was made during the field testing phase of the project to revise the pacing of the unit, it was clearly not sufficient to remedy the instructional weaknesses wrought by the inappropriately paced lessons. In the final analysis, it may be concluded that severe time limitations prevented a correct implementation of the designated

instructional strategies, and that this affected Group 1 to a greater extent than Group 2. This conclusion would account for the differential results (both cognitive and affective) observed in the two treatment groups, and the failure of the instructional unit to influence positively the cognitive learning of Group 1 students at all.

Emphasis of the cooperative learning strategy. As explained above, the obtained cognitive results more closely resemble an aptitude by treatment interaction, than they do the type of overall effect that is hypothesized in the literature on two sigma. The achievement results reported for Group 2(in which only the lower ability students were observed to have benefited from the instructional unit), although atypical of results reported in other studies addressing the two sigma challenge, are fairly typical of the pattern of results that is frequently obtained in studies concerning cooperative learning. Slavin (1983) has noted that cooperative learning often tends to favour either high or low achievers (as opposed to average achievers). In a nutshell, then, the cognitive achievement results obtained for Group 2 students in the present study, seem to mimic closely the ability by treatment outcomes that are characteristic of studies in cooperative learning. One possible reason why this might have occurred may be the unmatched emphasis that was placed on the cooperative learning strategy in the instructional design. Although the instructional unit was intended to employ a balanced combination of the three chosen instructional strategies, with each applied in equal measure, in reality, this did not occur. Instead, considerable emphasis was placed on cooperative learning, with student classroom participation and advance organizers occupying something of a secondary position. Cooperative learning was the focus of the affective objectives included in the instructional unit, and constituted the central theme of

the attitudinal changes that the project sought to affect. It was on cooperative interaction that the students were encouraged to concentrate their efforts, and even the evaluation questionnaires that they filled out on a weekly basis stressed the cooperative aspect of the instructional unit. In fact, the students were never alerted to the participation and advance organizer aspects of the instructional unit, as they were to cooperative learning. Even the instructors came to refer to the unit as a "cooperative learning instructional unit". It is probable that this unmatched emphasis on cooperative learning occurred as a result of the fact that initially, cooperative learning was to be the sole instructional strategy employed in the unit. Whatever the reason behind it, the concentration placed on the cooperative learning strategy in the instructional design may have negated, or at least de-emphasized, the effect of the other two instructional strategies. If this is so, the obtained cognitive results may represent nothing more than the influence on student achievement of a single instructional strategy (cooperative learning), as opposed to reflecting the effect of three strategies combined.

Mismatch of objective level and instructional strategy. During the development phase of the instructional unit, the instructional design expert several times expressed a concern about the use of such sophisticated instructional strategies as cooperative learning and student participation for such low level behavioral objectives as were included in the unit. As explained earlier, the behavioral objectives which made up the instructional unit were predominantly lower level objectives, operating almost exclusively at the verbal knowledge and comprehension levels of the cognitive domain. It was the opinion of the instructional design expert that the small group activities employed to teach these objectives would be more appropriate for the teaching of higher level objectives involving application, synthesis, or problem solving. He felt that the

enhanced participation and involvement with the instructional material contained in the unit would, in ways, be wasted on the lower level objectives, since the attainment of these objectives would probably not be any more effectively facilitated by way of the above strategies, than they would be if a more conventional, lecture-based strategy were employed.

In various discussions with colleagues, in the period of time since the cognitive results first became evident, many comments have been made regarding the low level of the behavioral objectives included in the project. Several individuals (all of whom were well acquainted with the project in question) have indicated their belief that the employed instructional strategies would certainly have been more beneficial for higher level objectives than they were for the lower ones, and that larger differences between the performance of the treatment and control groups would have emerged when the attainment of these hypothetical, higher level objectives would have been tested. The frequency and ardour with which these claims have been made have led me to consider the possibility that the instructional strategies were poorly matched with the level of the behavioral objectives included in the instructional unit. It should be noted, however, that this possibility is not strongly supported in the literature regarding the two sigma challenge, nor in that concerning the separate instructional strategies. In terms of two sigma, for example, several studies have found support for the fact that combining instructional strategies may aid both higher and lower mental processes (Mevarech, 1980, 1985; Tenenbaum, 1982, 1986). Similarly, cooperative learning has been known to aid both lower mental processes (Haines & McKeachie, 1967) as well as higher ones (Slavin, 1983). These studies do show, nevertheless, that the instructional strategies in question are likely to have a greater influence on higher mental processes than on lower ones (Bloom, 1984), and this renders plausible the belief that the combined

instructional strategies employed in the present study may have been found more effective had they been used with higher level objectives.

Problems in the Choice of Instructional Strategies

According to Bloom (1984), one of the major concerns of further research on the two sigma problem should be to uncover which two or three instructional variables can best be combined together. In the present study, three instructional strategies, involving three different change objects, were combined. The method used to select these three instructional strategies was in keeping with Bloom's suggestion of combining different objects of the change process. Despite this fact, the hypothesized achievement results were not obtained. The failure to achieve the desired results may be directly related to problems in the choice of the specific instructional strategies that were combined in this project. These problems may be viewed from several perspectives:

Ineffective variable combination. First of all, it is possible that the three instructional strategies employed in the present study (namely, cooperative learning, student classroom participation, and advance organizers) simply do not combine well together, despite the fact that, according to Bloom's classification system, they represent different aspects of the instructional process. The logic of how this might occur becomes clear if one thinks of combining instructional strategies in terms of preparing a balanced meal. The fact that a meal is balanced, does not necessarily mean that it tastes good. One could, for example, combine ingredients containing the right proportion of protein, fats and carbohydrates, and produce a balanced, but foul-tasting meal. Similarly, although in theory, the combination of cooperative learning, student participation and advance organizers appears to make sense, in practice, they may not

constitute the type of "goodness of fit" that results in a complementary cognitive effect.

Overlap of instructional variables. Another possible explanation for not achieving the desired two sigma effect may lie in the fact that two of the three strategies employed in the instructional unit tended to overlap, despite the fact that Bloom had classified them as affecting different objects of the change process. According to Bloom (1984), the object that is directly affected by the introduction of cooperative learning into the instructional situation is the peer group, while student classroom participation is quoted as affecting both the learner and the teacher (see Table 1 in Chapter 2). In the present study, however, these designations do not hold very well, since the Jigsaw cooperative strategy does not only affect the peer group, but also radically changes the role of both the teacher and the student, much in the same way as student participation does. Hence, instead of these two strategies being complementary, they are in fact parallel, and highly similar. It is highly conceivable that, owing to the similarity of these two strategies, the effect of combining them may simply not be additive. Since the rationale for choosing to combine these specific strategies was heavily guided by Bloom's classification system, the reliability of this classification system must surely be held in question. (Note: This issue is addressed in further detail in the following section.)

Unsuitability of cooperative learning strategy. Finally, there exists the possibilty that, in so far as the search for solutions to the two sigma challenge is concerned, cooperative learning is not a suitable instructional strategy for combination. First of all, the fact that cooperative learning has frequently been found to bring about aptitude by treatment effects, suggests that it cannot be

relied upon to yield the overall cognitive gains (beneficial to all, as opposed to only certain treated subjects) that are desirable for the two sigma effect. Secondly, while cooperative learning has been shown unequivocably to benefit ethnic and other interpersonal relations, and to increase self-esteem (Slavin, 1983), the effect of the strategy on student achievement is somewhat less certain. While two meta-analyses on the topic (Johnson & Johnson, 1974; Johnson, Maruyama, Johnson, Nelson & Skon, 1981) strongly suggest that cooperative learning is better than competitive and individualistic incentive structures, a third meta-analysis by Michaels (1977), reviewing much of the same literature, draws the conclusion that for most tasks, competition is better than cooperation. Moreover, other researchers have found no significant differences on achievement tests between students exposed to cooperative conditions and those exposed to non-cooperative ones (Hamblin, Hathaway & Wodarski, 1971; Moskowitz, Malvin, Schaffer & Schaps, 1983). To make matters even more complicated, the various cooperative learning methods such as Student Teams-Achievement Divisions (STAD) and Teams-Games-Tournaments (TGT), possess different critical features, and may therefore each produce a different effect on student achievement. As explained in Chapter 2, for example, the fact that Aronson's Jigsaw method does not entail a group reward structure, makes it less likely to have a positive effect on student achievement, than any of the alternative cooperative methods which do possess the essential reward structure. This point brings us to consider the possibility that the Jigsaw method used in the present study, devoid as it was of a group reward structure, may have limited even further the potential effectiveness of cooperative learning as an instructional strategy.

Theoretical Uncertainties of the Two Sigma Problem

In Chapter 2, several uncertainties surrounding the notion of combining instructional strategies were addressed. These concerned: the appropriateness of combining variables in higher education; the question of whether variables other than mastery can be additive; the issue of whether variables with lower effect sizes may be combined; and Bloom's categorization of the instructional variables in question. It was precisely these uncertainties which the present study aimed to clarify. Unfortunately, the obtained results do not definitively clarify the above issues, since any one of these uncertain areas may have contributed to the failure of the project to achieve the two sigma effect.

Two sigma and higher education. It is conceivable that the practice of combining instructional strategies is ineffective in higher education, and, therefore, was ineffective in the current study. It is known from educational research that a technique or method that is found to be appropriate for a particular sample of learners, may be found to be quite inappropriate when tested on a sample drawn from an alternative population. Thusfar, all of the positive results that have been gathered regarding the two sigma problem have involved elementary and secondary students, and there is nothing, as yet, to support the supposition that the approach may be beneficial for older learners. It should be recalled too, that the meta-analyses on which were based the calculated effect sizes used in Bloom's (1984) study, were very heavily weighted towards lower levels of education. Thus, the effect sizes associated with the three variables included in this study may not be an accurate representation of the actual effects that these variables exert on the learning of college and university students.

Mastery learning as a variable. A second possibility for the failure of this project is that mastery learning was not one of the variables included in the

study. It was suggested in Chapter 2 that, if the crux of combining instructional strategies is to emulate one-to-one tutoring, then it follows that mastery learning - the single strategy which most closely resembles one-to-one tutoring - may well be a necessary component for achieving the desired cognitive outcomes. It may be that the three strategies combined in the present study simply do not correspond closely enough to the one-to-one tutoring situation to bring about substantial cognitive gains. Cooperative learning has been criticized for its lack of systematic feedback-corrective procedures, and for the fact that it makes it possible for groups to demonstrate an overall mastery of objectives, while individual group members may not have fully understood the concepts being learned (Mevarech, 1985). Similarly, student classroom participation and advance organizers, while effective instructional strategies, are not as fully adapted to the specific needs of each student as is mastery learning, nor do they incorporate the constant feedback between teacher and student that is inherent in mastery learning and one-to-one tutoring. While both cooperative learning and student participation do provide students with some extent of autonomy over the means and pace of learning (Walberg, 1984), advance organizers do not.

It is felt that the use of mastery learning in studies concerning the two sigma challenge will more likely lead to positive achievement results, since this strategy most closely imitates the instructionally effective features of one-to-one tutoring. That is not to say, however, that it may not be possible to emulate the one-to-one tutorial method by using strategies other than mastery. To date, there exists only one study in which mastery learning was not employed as one of the combination variables, which has been successful in affecting cognitive achievement gains approaching two sigma. This study, carried out by Nordin (1981) in rural primary schools in Malaysia, was carefully designed so that it contained three essential factors: Cue (stimulus), participation (response) and

reward (reinforcement). It is not clear whether Nordin purposely aimed to set up an instructional situation which approximated the characteristics of one-to-one instruction, or if he was merely adhering to the instructional paradigm proposed by Dollard and Miller (1950) in which the above three factors, in addition to motivation, are named as the essential features of both simple and complex human learning. What is clear, however, is that all three of the factors included in Nordin's study are fundamental characteristics of the one-to-one tutoring method. It may be, then, that the rule of thumb presently being followed by Bloom and his students (i.e., that it is expedient to combine variables involving different objects of the change process), is less helpful as a guideline for choosing which variables to combine, than is the above-suggested notion of choosing instructional variables which together emulate the essential features of one-to-one tutoring. The validity of this suggestion can only be investigated through further research on the topic.

The use of variables with low effect sizes. Another uncertainty which the present study sought to clarify was whether variables with low effect sizes could be effectively combined. Like the other uncertain issues discussed in this section, it is not clear whether the use of the advance organizer instructional strategy (sigma = .2) served to help or hinder the cognitive learning of the students. While it is unlikely that the advance organizers included in the instructional unit had a detrimental effect on the cognitive outcomes of the project, one cannot be sure that any positive contribution was made by the inclusion of this fairly low effecting strategy. Once again, further research will be necessary before a decision regarding this issue can be reliably made. It is suggested that such research be designed to test separately each of the individual variables chosen for combination (e.g., Nordin, 1981), so that the effectiveness of each may be more accurately assessed.

Bloom's categorization of instructional variables. In a preceding section of this chapter, the wisdom of following Bloom's so-called "rule of thumb" for choosing instructional variables was challenged. This challenge notwithstanding, if one attributes any validity whatsoever to Bloom's notion that it is desirable to combine variables which affect different objects of the change process , then it becomes essential that the change object associated with each variable is accurately assessed. In the present study, the researcher was misled in her choice of instructional variables, since the change objects identified by Bloom did not accurately represent the reality of the changes affected by the various strategies in question. As explained above, cooperative learning and student classroom participation are described in Bloom's categorization system as influencing different change objects, while in actual fact, both of these strategies change the role of the teacher and that of the learner in the instructional situation. Hence, Bloom's categorization system leads one to believe that two essentially parallel strategies are dissimilar, and that they may therefore have an additive effect when combined. It is highly possible that, as a result of this inaccurate categorization, the variables combined in the present study did not yield an effect size of two sigma, simply because they did not differ sufficiently from one another in terms of the instructional objects that they influenced. Clearly, the categorization of variables, as presented in Bloom's (1984) study, should not be accepted at face value, but, rather, carefully scrutinized by researchers, before the final decision regarding variable combination is made.

Problems With the Practical Implementation of the Unit

In addition to the problems inherent in the design of the project, a number of shortcomings related to the implementation of the instructional unit in a practical, real-life setting are assumed to have adversely affected the outcomes

of the project. These included: the lack of control on the part of the researcher; the inappropriateness of the cognitive post-test; the inconsistent application of the unit by the instructors; the inequivalence of the treatment and control groups; and the insufficient exposure time. Each of these problems is explained in further detail below.

Lack of control on the part of the researcher. One of the greatest problems to emerge from the inherent duality of the current project (i.e., part instructional design/part experimental research endeavour) was a lack of control on the part of the researcher. Although the adoption of decisions which run counter to essential design principles is undesirable in both instructional design and experimental research, it is not unusual in the process of instructional design for the developer to have to share control over decisions with instructors and subject matter experts. In experimental research, on the other hand, any such loss of control by the researcher is likely to confound severely the design of the project. In short, the type of pragmatic and political compromises that characterize real-life instructional design projects, are unacceptable in experimental research. It is felt that the project in question was beset by a number of such compromises, and that these compromises had an adverse effect on the research concerns of the project.

It should be acknowledged that in the present study, the two course instructors made a concerted effort to accommodate and implement the requirements of the researcher/designer in the instructional unit. There were certain elements, however, which they felt they could not accommodate, for fear that these elements would be detrimental to, or undesirable for, their students. The adoption of a cooperative reward structure serves as a case in point. As explained earlier, the Jigsaw cooperative method has been criticized in the

literature regarding its lack of a cooperative reward structure. The researcher, therefore, suggested to the instructors that for the purpose of the current study, the Jigsaw method should be modified to contain a cooperative reward structure. The instructors considered this suggestion, but it the end they opted to implement the unadjusted version of the Jigsaw method. They felt that the adoption of a cooperative reward structure would be too threatening for their students, and therefore chose not to include it in the instructional treatment. Other instances where the preferences of the researcher were not adopted by the instructors included the design of the cognitive post-test, and the question of in-class observations. In the final analysis, it is apparent that the researcher did not have sufficient command over the instructional situation to ensure the correct implementation of elements essential to the research design of the project.

Inappropriateness of the cognitive post-test. For reasons explained above and earlier on in this paper, the post-test that was employed to assess the cognitive outcomes of the project was flawed in several ways. First of all, it consisted of multiple-choice questions, and, as such, tested recognition as opposed to recall. Secondly, the items contained in the post-test were not criterion referenced, and therefore did not correspond well to the behavioral objectives of the instructional unit. Finally, in addition to not being criterion-referenced, the content tested by the post-test items was almost exclusively that covered by the lower level objectives of the unit; only one of the 38 questions eventually employed in the calculation of cognitive post-scores even touched on content addressed by the higher level objectives included in the instructional unit.

It is felt that the employment of a multiple-choice test format resulted in the construction of a cognitive post-test instrument which did not discriminate well between treatment conditions. Inherent in any multiple-choice test is the

provision of information to the students, and the requirement that they recognize, as opposed to recall, the correct answers to the questions posed. This feature renders multiple-choice tests easier, and less discriminating than short-answer or essay type examinations. Quite obviously, one cannot hope to detect any differences in the ability of experimentally treated and untreated subjects to **recall** information, if one employs a testing instrument which assesses **recognition**. Moreover, by providing the students with a choice of answers, one allows for the possibility that students who neither understand thoroughly nor recall the concepts in question may nevertheless choose the correct response. In terms of the present project, in order for students to perform well on the cognitive post-test, it was not necessary for them to have acquired a thorough understanding of the three learning theories studied, nor to have grasped to any extent the applications of these theories to classroom teaching. And yet, these were the very skills which the experimental treatment aimed to enhance. It is strongly believed that, had the cognitive post-test instrument assessed recall, as opposed to recognition, greater differences in the cognitive achievement scores of the various treatment conditions would have been detected, and that these differences would have favoured the treatment groups.

Insofar as the non-criterion-referenced feature of the cognitive post-test is concerned, and the fact that the instrument concentrated almost exclusively on content covered by the lower level objectives of the unit, the author is convinced that the instrument in question provided a highly inadequate measurement of the cognitive benefits exerted by the instructional unit on the treated subjects. It is suggested that a more appropriate instrument would have been more successful in revealing these benefits. What this implies is that, even if the instructional unit had been successful in attaining all of its cognitive goals, the inappropriate nature of the cognitive post-test would have failed to reveal these successes. Clearly

then, the cognitive post-test needs to be completely revised before any future implementation of the instructional unit is attempted.

Inconsistent application by the instructors. The two instructors involved in the study found it somewhat difficult to carry out the prescribed instructional activities in the exact manner specified by the lesson plans. This is not surprising, especially when one considers the pacing problems inherent in the unit, as well as the very large number of instructional materials contained therein. Added to these difficulties was the fact that the instructors were quite unused to employing, in their university level classes, the three instructional strategies which made up the instructional unit.

In terms of their influence on the eventual outcomes of the project, the most significant effect of the application difficulties experienced by the instructors, was that they led to the omission and/or misapplication of several activities. Such omissions and incorrect applications were rarely consistent across the two treatment groups, and probably contributed, therefore, to the differential outcomes (both cognitive and affective) that were eventually detected in these two groups. Moreover, inasmuch as the instructors deviated from the original lesson plans, so too did the instruction actually received by the subjects deviate from the original instruction which constituted the experimental treatment. It appears, therefore, that in practice, the subjects were not exposed to the instructional treatment in the manner that they were initially intended to be.

Inequivalence of the treatment and control groups. When initially designing the present study, the researcher realized that it would be impossible to randomly assign subjects to treatments. As a result, the 133 subjects used in this project were left intact in three classes. Although this meant that the

experimental and control groups could not be guaranteed to possess pre-experimental sampling equivalence, it was felt that the recruitment of the subjects from a common population, with parallel educational backgrounds, would ensure that the groups were highly similar. In practice, this did not occur. On a cognitive basis, the prior achievement means of both the control group and the first treatment group tended to be much higher than that of the second treatment group (68.75, 67.11, and 63.80 respectively), although these differences did not reach statistical significance. Differences between the three groups became even more apparent when subjects were blocked into high, medium and low ability groups on the basis of their prior achievement scores. Table 12 reveals the break-down of students by ability level. It is apparent that there were many more lower level students in Group 2 than in either Group 1 or the control group. The three groups also differed in the proportion of middle and high ability students contained in each, with Group 1 containing relatively more middle ability students, and the control group containing relatively more high ability students than the other two groups.

It is highly probable that the cognitive results obtained in the present study were greatly influenced by the cognitive inequivalence of the three groups being studied. Similarly, inequivalence among the prior attitudes of the three groups towards cooperative learning may have influenced the results obtained for this affective measure. It was found that, immediately before treatment, the attitudes of the two experimental groups towards cooperative learning were somewhat higher than those of the control group. Although statistically significant between-group differences were detected for only five of the 16 attitudinal pre-test items, a tendency for the attitudes of the two experimental groups to be higher was noted throughout. This trend may be attributed to the fact that, prior to exposure, the

subjects were aware of the treatment to which they were to be exposed. This awareness may well have altered the attitudes of the subjects, and resulted in a non-equivalent pre-experimental sample.

Table 12: Break-down of treatment group by ability level

Groups	n	Proportion of Students Per Ability Level in Each Group		
		Low	Medium	High
Coop 1	42	31%	40%	29%
Coop 2	38	53%	21%	26%
Control	40	27%	35%	38%

Insufficient exposure time. A final possible explanation for the somewhat disappointing cognitive outcomes of the project is simply that the exposure time may have been insufficient. In previous research on the two sigma problem, exposure time has ranged from three to 15 weeks long (Burke, 1984; Mevarech, 1985). Typically, those studies involving the shorter time periods have been conducted in elementary schools, such that exposure was on a daily, as opposed to weekly, basis. Even those studies carried out in high schools have, for the most part, involved daily exposure of the students (e.g., Mevarech, 1986). Hence, exposure time in all of the previous studies has been quite substantial. In the present study, on the other hand, exposure lasted a full five weeks, but amounted to only twelve and a half hours of instruction. This is considerably shorter than in previous studies. It should also be noted that two of the three

instructional strategies employed in the project (namely, cooperative learning and student classroom participation) have been shown in the literature to require extensive exposure time, in order to have a positive effect on student learning (Slavin, 1983; Nordin, 1981). Clearly, the relatively short exposure time which characterized the present project, may quite conceivably have impeded the effectiveness of these two strategies.

In addition to the fact that the exposure time was inherently short, attendance also proved to be a problem. While attendance in Group 2 was consistently high, that in Group 1 and the control group tended to vary greatly, with some students missing as many as four out of the five lessons. The low attendance observed in the latter two groups is a well known characteristic of tertiary level education, where students have greater control over the decision to attend or not to attend classes than they do in elementary and secondary schools. It is felt that poor attendance exacerbated the already short exposure time, and that, as a result, subjects were not exposed sufficiently to the experimental treatment to bring about the type of strong cognitive effect predicted by the central research hypothesis of the study.

Conclusions and Recommendations

It may be concluded that, as implemented, the designed instructional unit exerted a fairly strong influence on the attitudes and social interaction of the exposed students, and a somewhat weaker, but nevertheless valuable, effect on their cognitive achievement. Although the much coveted two sigma effect was not obtained in the present study, this does not imply that the search for methods of group instruction which are as effective as one-to-one tutoring should be abandoned. On the contrary, it is my opinion that the two sigma challenge

represents one of the most worthwhile pursuits for educational technology today. Given the high cost of one-to-one tutoring, it is likely that group instruction will remain the primary mode of formal instruction for many years to come. In this light, the search for more effective methods of group instruction - methods which more precisely respond to the needs of the individual learner - becomes a focal point for educators and educational technologists alike.

As illustrated above, the disapointing cognitive results obtained in the present study may have been caused by any of a wide variety of factors. While it is not clear which of these factors most strongly influenced the project outcomes, it is likely that, by revising these factors, the success of future studies involving the process of combining instructional strategies may be enhanced. As a result of the outcomes of the present experience, a number of recommendations for future projects may be suggested.

First of all, in terms of choosing which two or three variables to combine, it is recommended that individuals conducting future studies regarding the two sigma challenge should either avoid employing cooperative learning as one of the combination variables, or ensure that the particular cooperative learning strategy that is chosen has been observed in the literature to be highly successful in improving cognitive achievement. Slavin (1983, pp. 39-65) has delineated the methodological requirements necessary for successful studies on cooperative learning, as well as the precise features of cooperative methods that have been shown to positively influence cognitive achievement. It is highly recommended that anyone intending to employ cooperative learning as a combination variable in future research should refer to the above cited pages of Slavin's book.

Two further recommendations regarding variable combination may be made: It is strongly recommended that 1.) any overlap of the instructional

strategies, with respect to the change object they effect, should be avoided, and 2.) that strategies which together emulate the conditions of one-to-one tutoring should be combined. I would like to suggest that Bloom's belief that an effect size of two sigma may be achieved by simply combining strategies which affect different change objects, while valid, may, on its own, be too simplistic. It seems to me that the crux of the two sigma challenge lies not in the simple addition of effect sizes, but rather, in the careful combination of strategies which together approximate the instructional characteristics of one-to-one tutoring. Hence, I propose that the choice of combination variables be guided not only by the fact that they affect different change objects, but also on the basis of the extent to which they emulate the educationally effective characteristics of the one-to-one tutorial method. Researchers should also beware of combining variables according to Bloom's categorization system. As mentioned earlier, careful scrutiny of the changes affected by each variable should be carried out, before the final decision regarding variable combination is made.

In addition to the above suggestions regarding the choice of combination variables, several other guidelines for future research on the two sigma problem may be drawn from the current experience. First of all, it is highly recommended that future studies make use of treatment conditions which expose subjects to each of the individual instructional strategies separately. That is to say, if participation and mastery learning were the variables chosen for combination, then four condition groups would be set up: one consisting of participation only; one involving mastery learning only; one which included both strategies; and one which included neither (i.e., the control). This was not done in the present study, since there were not enough groups of students available to warrant the creation of five experimental conditions. Consequently, it was impossible to discern in the present study which of the combined instructional strategies were not functioning

as intended (i.e., in accordance with their calculated effect sizes) and, therefore, to pinpoint the failure of the study to achieve its hypothesized outcomes.

It is felt that the failure to achieve an effect size approximating two sigma in the current project was also due in part to the inappropriate nature of the cognitive post-test instrument. Future researchers would be wise to ensure that they have complete control over the design or choice of all testing instruments, and that those instruments employed assess accurately the objectives being taught. It is also felt that future projects on the two sigma question would greatly benefit by extending the exposure time of the treatment. With regard to the issue of whether the two sigma effect may be obtained in higher education, and whether variables with lower effect sizes are suitable for combination, the findings of the present study were inconclusive. It is therefore recommended that further research be conducted to investigate these still unanswered questions.

Successful as it was in influencing the affective and sociometric objectives of the current project, it is possible that the designed instructional unit will never succeed in affecting cognitive gains approaching two sigma. That is not to say, however, that the unit has no worth in terms of its influence on cognitive achievement. We have seen how, even with its many flaws, the unit may be successful in improving the cognitive achievement of lower learners. It is hoped that, once revised, the cognitive effectiveness of the instructional unit will be greatly enhanced. The most obvious revision that needs to be carried out is the slowing down of the pacing of the unit. This may be accomplished by way of any one of the methods suggested in Chapter 4. In addition to this and the other revisions suggested in Chapter 4, it is furthermore urged that a cooperative reward structure (as defined by Slavin, 1983) be added to the Jigsaw strategy, and that the higher level objectives included in the unit be more strongly stressed. Finally, it is recommended that the cognitive post-test instrument be

revised, so that it no longer consists of multiple-choice items, and so that the items it does contain are criterion referenced to the behavioral objectives (both high and low level) that are specified by the instructional unit.

It is felt that some mention should be made in this final section about the wisdom of combining, in a single project, experimental research and instructional design. From the point of view of instructional design, the notion of having available a control condition is an attractive one, since it allows one to thoroughly evaluate the relative effectiveness of decisions based on a systems approach to instructional design, as compared with a situation wherein such principles have not guided the development of the instruction. One could compare, for example, instructional situations in which systematic design principles have and have not been used as the means for identifying the instructional objectives, and in this way ascertain whether, and to what extent, the former is more beneficial to learning than the latter. Alternatively, one may want to hold constant the use of systematically derived behavioral objectives, but vary the method of developing the instructional strategy. This is precisely what was done in the present study, where the behavioral objectives employed in both conditions were determined by way of systematic instructional design, but only the instructional strategy of the treatment condition was determined in accordance with systematic design principles. It should be stressed that the employment of a control group in the field testing of an instructional unit does not undermine the necessity nor importance of criterion referencing. It is my opinion that the two notions are not so mutually exclusive as they are commonly perceived to be. The compatability of the two concepts becomes clear when one considers the usefulness of comparing two instructional situations, both of which share the same instructional objectives, and in which 80% of the students in the first situation master all of the objectives, while only 60% of the students in the second condition are successful

in attaining mastery. In this context, the instructional value of the variables that were not held constant across the two situations becomes explicit. This information may then be used to effectively revise the original instructional unit or product, and may also contribute to the body of knowledge that is currently available regarding the value of the specific processes involved in instructional design.

While research elements such as a control group and variable manipulation are considered to be beneficial to the process of instructional design, the combination of the two processes is considerably less desirable when viewed from the perspective of experimental research. This is because the stringent control that is necessary in a research endeavour is not often available in an instructional design project. This is especially true when the instructional design is being run for the very first time, since the outcomes of the various decisions made by the designer will not yet have been tested, and may, therefore, interfere with, and even confound, the variables which form the focus of the research design. Such was the case in the present project, where the factors most responsible for the project outcomes have remained unclear, simply because it was impossible to discern, with any certainty, the extent to which the attained results were influenced by problems in the instructional design, or caused by the experimentally manipulated variables. Given the experiences of the researcher in the present situation, then, it is recommended that the combination of research elements and instructional design procedures be pursued only in projects where instructional design is the main focus of study, and avoided in projects where experimental research is the central concern.

In the final analysis, the present study may be viewed as a hybrid of sorts; one which has embodied principles of systematic instructional design, while at the same time responding to Bloom's two sigma challenge. It is hoped that the

problems encountered in this study, and the various solutions recommended herein, will serve to guide future researchers who embark on projects of a similar nature.

REFERENCES

Allen, D. I. (1970) Some effects of advance organizers and level of retention of written social studies material. (Doctoral dissertation, University of California, 1969). Dissertation Abstracts International, 30, 4267A.

Anania, J. (1983). The influence of instructional conditions on student learning and achievement. Evaluation in Education: An International Review Series, 7(1), 1-92.

Aronson, E. (1978). The jigsaw classroom. Beverley Hills, CA: Sage.

Ausubel, D. P. (1978). In defense of advance organizers: A reply to the critics. Review of Educational Research, 48(2), 251-257.

Ausubel, D. P. (1960). The use of advance organizers in the learning and retention of meaningful verbal material. Journal of Educational Psychology, 51(5), 267-272.

Ausubel, D. P., & Fitzgerald, D. (1961). The role of discriminability in meaningful verbal learning and retention. Journal of Educational Psychology, 52(5), 266-274.

Ausubel, D. P., & Fitzgerald, D. (1962). Organizer, general background, and antecedent learning variables in sequential verbal learning. Journal of Educational Psychology, 53, 243-249.

Ausubel, D. P., & Youssef, M. (1963). Role of discriminability in meaningful parallel learning. Journal of Educational Psychology, 54, 331-336.

Baggaley, J. (1987). Continual response measurement: Design and validation. Canadian Journal of Educational Communication, 16(3), 217-238.

Barnes, B. R., & Clawson, E. V. (1975). Do advance organizers facilitate learning? Recommendations for further research based on an analysis of 32 studies. Review of Educational Research, 45(2), 637-659.

Barron, R. F. (1971). The effects of advance organizers upon the reception of learning and retention of general science content (Final report) (Project No. 1B-030). Washington, DC: Department of Health, Education, and Welfare. (ERIC Document Reproduction Service No. ED 061 554)

Bauman, D. J., Glass, G. V., & Harrington, S. A. (1969). The effects of the position of an organizer on learning meaningful verbal materials (Research Paper No. 24). Laboratory of Educational Research, University of Colorado.

Bereday, G. Z. (1969). Essays on world education: The crisis of supply and demand. New York: Oxford University Press.

Biehler, R. F., & Snowman, J. (1986). Psychology applied to teaching (5th ed.). Boston, MA: Houghton Mifflin.

Blaney, N. F., Stephan, C., Rosenfield, D., Aronson, E., & Sikes, J. (1977). Interdependence in the classroom: A field study. Journal of Educational Psychology, 69(2), 121-128.

Block, J. H. (Ed.). (1971). Mastery learning. New York: Holt, Rinehart, & Winston.

Bloom, B. S. (1984). The two sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. Educational Researcher, 13(4), 4-16.

Bloom, B. S. (1980). The new direction in educational research: Alterable variables. Phi Delta Kappan, 61(6), 382-385.

Bloom, B. S. (1976). Human characteristics and school learning. New York: McGraw Hill.

Bloom, B. S. (1968). Learning for mastery. UCLA Evaluation Comment, 1(2), 1-12.

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Taxonomy of educational objectives: Handbook 1, cognitive domain. New York: Longman.

Bobrow, S. A., & Bower, G. H. (1969). Comprehension and recall of sentences. Journal of Experimental Psychology, 80, 455-461.

Bouton, C., & Garth, R. Y. (1983). Students in learning groups: Active learning through conversation. In C. Bouton & R. Y. Garth (Eds.), Learning in groups: New directions in teaching and learning (pp. 73-81). San Francisco: Jossey BassBower, G. H., & Hilgard, E. R. (1981). Theories of learning (5th ed.). Englewood Cliffs, NJ: Prentice Hall.

Brothen, T. F. (1986). Using active learning in large classes. In S. F. Schomberg (Ed.), Strategies for active teaching and learning in university classrooms: A handbook of teaching strategies. University of Minnesota. (ERIC Document Reproduction Service No. ED 276 356)

Burke, A. J. (1983). Student's potential for learning contrasted under tutorial and group approaches to instruction. (Doctoral dissertation, University of Chicago, 1983). Dissertation Abstracts International, 44(7), 2025A.

Carroll, J. B. (1963). A model of school learning. Teachers College Record, 64(5), 723-733.

Charlesworth, W. (1986). Introducing active learning: Conceptual and practical problems. In S.F. Schomberg (Ed.), Strategies for active teaching and learning in university classrooms: A handbook of teaching strategies. University of Minnesota. (ERIC Document Reproduction Service No. ED 276 356)

Coldeway, D., & Coldeway, A. (1987). An extension of PSI through the application of instructional systems design technology. Canadian Journal of Educational Communication, 16(4), 279-293.

Cook, S. W. (1979). Interpersonal and attitudinal outcomes of cooperating interracial groups. Journal of Research and Development in Education, 12(1), 97-113.

Cox, J. (1984). Cooperative learning: An innovative approach to teaching reading theory and practice. Paper presented at the 28th annual meeting of the College Reading Association, Washington, DC. (ERIC Document Reproduction Service No. ED 255 879)

Cronbach, L. J., & Snow, R. E. (1977). Aptitude and instructional methods: A handbook for research on interactions. New York: Irvington.

Davidson, N. (1985). Small group learning and teaching in mathematics: A selective review of the research. In R. Slavin, S. Sharan, S. Kagan, R. Hertz-Lazarowitz, C. Webb, & B. Schmuck (Eds.), Learning to cooperate: Cooperating to learn (pp. 211-230). New York: Plenum Press.

DeVries, D. L., & Slavin, R. E. (1978). Teams-Games-Tournaments (TGT): Review of ten classroom experiments. Journal of Research and Development in Education, 12(1), 28-38.

Dick, W., & Carey, L. (1985). The systematic design of instruction (2nd ed.). Glenview, Illinois: Scott, Foresman and Co.

Dollard, J., & Miller, N. E. (1950). Personality and psychotherapy. New York: McGraw Hill.

Duin, A. H. (1984, May). Implementing cooperative learning in the writing curriculum. What research shows and what you can do. Paper presented at the annual meeting of the Minnesota Council of Teachers of English, Mankato, MN. (ERIC Document Reproduction Service No. ED 251 849)

Edwards, K. J., DeVries, D. L., & Snyder, J. P. (1972). Games and teams: A winning combination. Simulation and games, 3(3), 247-269.

Fitzgerald, D., & Ausubel, D. P. (1963). Cognitive versus affective factors in the learning and retention of controversial material. Journal of Educational Psychology, 54, 73-84.

Fraser, S. C., Beaman, A. L., Diener, E., & Kelem, R. T. (1977). Two, three, or four heads are better than one: Modification of college performance by peer monitoring. Journal of Educational Psychology, 69(2), 101-108.

Elkind, D. (1976). Child development and education: A Piagetian perspective. New York: Oxford University Press.

Feller, W. A. (1973). The effects of two types of advance organizers and two types of spaced questions on the ability of a selected group of tenth grade biology students to recall, comprehend, and apply facts from written science material. (Doctoral dissertation, Temple University, 1973). Dissertation Abstracts International, 34, 1766A.

Gagne, R. M., & Briggs, L. J. (1979). Principles of instructional design (2nd ed.). New York: Holt, Rinehart and Winston.

Garibaldi, A. M. (1979). Affective contributions of cooperative and group goal structures. Journal of Educational Psychology, 71(6), 788-794.

Gates, A. I. (1917). Recitation as a function in memorizing. Archives of Psychology, 6, 40.

Gnagey, W. J. (1962). The comparative effects of small-group vs. teacher-led discussion sessions upon student achievement and perception in educational psychology. Journal of Educational Research, 56(1), 28-32.

Green, T. G. (1986). The effect of structured worksheets on student performance. Journal of Dental Education, 50(10), 616-617.

Grotelueschen, A., & Sjogren, D. D. (1968). Effects of differentially structured introductory materials and learning tasks on learning and transfer. American Educational Research Journal, 5, 191-202.

Hamblin, R. L., Hathaway, C., & Wodarski, J. S. (1971). Group contingencies, peer tutoring, and accelerating accademic achievement. In E. Ramp & W. Hopkins (Eds.), A new direction for education: Behavior analysis. Lawrence, KS: The University of Kansas, Department of Human Development.

Hamilton, J. D. (1976). The McMaster curriculum: A critique. British Medical Journal, 1(6019), 1191-1196.

Hansell, S., & Slavin, R. E. (1981) Cooperative learning and the structure of inter-racial friendships. Sociology of Education, 54(2), 98-106.

Hovland, C. I., Lumsdaine, A. A., & Sheffield (1949). Experiments on mass communication. Princeton: Princeton University Press.

Hulten, B. H., & DeVries, D. L. (1976). Team competition and group practice: Effects on student achievement and attitudes (Report No. 212). Baltimore, MD: Johns Hopkins University, Center for Social Organization of Schools. (ERIC Document Reproduction Service No. ED 154 021)

Johnson, D. W., & Johnson, R. T. (1983). Effects of cooperative, competitive and individualistic learning experiences on social development. Exceptional Children, 49(4), 323-330.

Johnson, D. W., & Johnson, R. T. (1978). Cooperative, competitive and individualistic learning. Journal of Research and Development in Education, 12(1), 3-15.

Johnson, D. W., & Johnson, R. T. (1974). Instructional goal structure: Cooperative, competitive or individualistic. Review of Educational Research, 44(2), 213-240.

Johnson, D. W., Johnson, R. T., & Rynders, J. (1981). Effects of cooperative, competitive and individualistic experiences on self-esteem of handicapped and nonhandicapped students. Journal of Psychology, 108(1), 31-34.

Johnson, D. W., Maruyama, G., Johnson, R. T., Nelson, D., & Skon, L. (1981). Effects of cooperative, competitive and individualistic goal structures on achievement: A meta-analysis. Psychological Bulletin, 89(1), 47-62.

Keppel, G. (1982). Design and analysis: A researcher's handbook (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Kohn, A. (1987, October). Its hard to get left out of a pair. Psychology Today, pp. 53-57.

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Englewood Cliffs, NJ: Prentice Hall.

Kraft, R. G. (1985). Group-inquiry turns passive students active. College Teaching, 33(4), 149-154.

Krahn, C. G., & Blanchaer, M. C. (1986). Using an advance organizer to improve knowledge application by medical students in computer-based clinical simulations. Journal of Computer-Based Instruction, 13(3), 71-74.

Kunihara, S., & Asher, J. J. (1965). The strategy of the total physical response: An application to learning Japanese. International Review of Applied Linguistics, 3, 277-289.

Lawton, J. T., & Wanska, S. K. (1977). Advance organizers as a teaching strategy: A reply to Barnes and Clawson. Review of Educational Research, 47(2), 233-244.

Levine, L. H., & Loerinc, B. M. (1985). Investigating the scope of an advance organizer for compiler concepts. Journal of Educational Technology Systems, 13(3), 175-183.

Leyton, F. S. (1983). The extent to which group instruction supplemented by [redacted]tery of the initial cognitive prerequisites approximates the learning effectiveness of one-to-one tutorial methods. (Doctoral dissertation, University of Chicago, 1983). Dissertation Abstracts International, 44(4), 974A.

Lippitt, P., & Lippitt, R. (1968). The peer culture as a learning environment. Childhood Education, 47(3), 135-138.

Luiten, J., Ames, W., & Ackerson, G. (1980). A meta-analysis of the effects of advance organizers on learning and retention. American Educational Research Journal, 17(2), 211-218.

Lysakowski, R. S., & Walberg, H. J. (1982). Instructional effects of cues, participation, and corrective feedback: A quantitative synthesis. American Educational Research Journal, 19(4), 559-578.

Madden, N., & Slavin, R. (1983). Mainstreaming students with mild handicaps: Academic and social outcomes. Review of Educational Research, 53(4), 519-569.

Maller, J. B. (1929). Cooperation and competition. New York: Columbia Teachers College.

Mallor, J. P., Near, J. P., & Sorcinelli, M. D. (1981). Increasing student involvement in large lecture courses: Two case studies. Journal of Experiential Learning and Simulation, 3(3-4), 191-196.

McClintock, E., & Sonquist, J. A. (1976). Cooperative task-oriented groups in a college classroom: A field application. Journal of Educational Psychology, 68(5), 588-596.

McDougall, K., & Gimple, D. (1985). Cooperative learning strategies for teaching small group communication: Research and application. Paper presented at the 71st annual meeting of the Speech Communication Association, Denver, CO. (ERIC Document Reproduction Service No. ED 271 800)

McKeachie, W. J. (1974). The decline and fall of the laws of learning. Educational Researcher, 3, 7-11.

Michael, D. N., & Maccoby, N. (1961). Factors influencing the effects of student participation in verbal learning from films. In A. Lumsdaine (Ed.), Student response in programmed instruction (pp. 271-293). Washington, DC: National Academy of Sciences.

Michaels, J. W. (1977). Classroom reward structures and academic performance. Review of Educational Research, 47(1), 87-98.

Michaelsen, L. K., & Obenshain, S. (1983). Developing professional competencies. In C. Bouton & R. Y. Garth (Eds.), Learning in groups: New directions in teaching and learning (pp. 31-40). San Francisco: Jossey Bass.

Mitchell, P. D. (1980). A positive feedback model of interest in learning new topics. Paper presented to the 5th European meeting on Cybernetics and Systems Research, Vienna, Austria.

Morton-Bohlmeyer, E., & Burke, J. P. (1987). Selecting cooperative learning techniques: A consultative strategy guide. School Psychology Review, 16(1), 36-49.

Moskowitz, J. M., Malvin, J. H., Schaffer, G. A., & Schaps, E. (1985). Evaluation of Jigsaw, a cooperative learning technique. Contemporary Educational Psychology, 10, 104-112.

Moskowitz, J. M., Malvin, J. H., Schaffer, G. A., & Schaps, E. (1983). Evaluation of a cooperative learning strategy. American Educational Research Journal, 20(4), 687-697.

Nordin, A. B. (1981). Improving learning: An experiment in rural primary schools in Malaysia. Evaluation in Education: An International Review Series, 4(2), 143-263.

Northway, M. L. (1967). A primer of sociometry (2nd ed.). Toronto: University of Toronto Press.

Peterson, P. L., Janicki, T., & Swing, S. (1981). Ability X treatment interaction effects on children's learning in largegroup and smallgroup approaches. American Educational Research Journal, 18(4), 453-473.

Piaget, J. (1970). Science of education and the psychology of the child. New York: Orion Press.

Scandura, J. M., & Wells, H. N. (1967). Advance organizers in learning abstract mathematics. American Educational Research Journal, 4, 295-301.

Scriven, M. (1967). The methodology of evaluation. In R. W. Tyler, R. Gagne, & M. Scriven (Eds.), Perspectives of curriculum evaluation. (AERA monograph series on curriculum evaluation, no.1), pp. 39-83. Chicago: Rand McNally.

Sharan, S. (1980). Cooperative learning in small groups: Recent methods and effects on achievement, attitudes and ethnic relations. Review of Educational Research, 50(2), 241-271.

Slamecka, N. J., & Graf, P. (1978). The generation effect: Delineation of a phenomenon. Journal of Experimental Psychology: Human Learning and Memory, 4(6), 592-604.

Slavin, R. E. (1985). Team-assisted individualization: Combining cooperative learning and individualized instruction in mathematics. In R. Slavin, S. Sharan, S. Kagan, R. Hertz-Lazarowitz, C. Webb, & B. Schmuck (Eds.), Learning to cooperate: Cooperating to learn (pp. 177-209). New York: Plenum Press.

Slavin, R. E. (1983). Cooperative learning. New York: Longman Inc.

Slavin, R. E. (1980). Using Student Team Learning. Baltimore, MD: Center for Social Organization of Schools, Johns Hopkins University.

Slavin, R. E. (1977). Classroom reward structure; An analytic and practical review. Review of Educational Research, 47(4), 633-650.

Slavin, R. E., & Oickle, E. (1981). Effects of cooperative learning teams on student achievement and race relations: Treatment by race interactions. Sociology of Education, 54(3), 174-180.

Smith, K. A. (1986). Cooperative learning groups. In S. F. Schomberg (Ed.), Strategies for active teaching and learning in university classrooms: A handbook of teaching strategies. University of Minnesota. (ERIC Document Reproduction Service No. ED 276 356)

Smith, K. A., Johnson, D. W., & Johnson, R. T. (1981). Structuring learning goals to meet the goals of engineering education. Engineering Education, 72(3), 221-226.

Tenenbaum, G. (1986). The effect of quality of instruction on higher and lower mental processes, and on the prediction of summative achievement. Journal of Educational Research, 80(2), 105-114.

Tenenbaum, G. (1982). A method of group instruction which is as effective as one-to-one tutorial instruction. (Doctoral dissertation, University of Chicago, 1982). Dissertation Abstracts International, 43(6), 1822A.

Walberg, H. J. (1984). Improving the productivity of American schools. Educational Leadership, 41(8), 19-27.

Walberg, H. J., & Shanahan, T. (1983). High school effects on individual students. Educational Researcher, 12(7), 4-9.

Webb, N. M. (1985). Student interaction and learning in small groups: A research summary. In R. Slavin, S. Sharan, S. Kagan, R. Hertz-Lazarowitz, C. Webb, & B. Schmuck (Eds.), Learning to cooperate: Cooperating to learn (pp. 147-172). New York: Plenum Press.

Webb, N. M. (1977). Learning in individual and small group settings (Technical Report No. 7). Arlington, VA: Office of Naval Research, Personnel and Training Research Programs Office. (ERIC Document Reproduction Service No. ED 151 699)

Webb, N. M., & Kenderski, C. (1982, May). Student interaction and learning in small group and whole class settings. Paper presented at the Conference on Student Diversity and the Organization, Processes and Uses of Instructional Groups in the Classroom, Madison, WI.

Weigel, R. H., Wiser, P. L., & Cook, S. W. (1975). Impact of cooperative learning experiences on cross-ethnic relations and attitudes. Journal of Social Issues, 31(1), 219-245.

Weston, C. B. (1987). The importance of involving experts and learners in formative evaluation. Canadian Journal of Educational Communication, 16(1), 45-58.

Weston, C. B. (1986). Formative evaluation of instructional materials: An overview of approaches. Canadian Journal of Educational Communication, 15(1), 5-17.

Appendix A

Instruments

EDUCATIONAL PSYCHOLOGY C210 - PRE-TEST

Note: No grades will be awarded for your performance on this test.

Answer all of the following questions that you feel you really know. you should make no attempt to guess.

The test is divided up into 7 sections. The first section consists of a number of definitions. You will notice that each definition is associated with a certain section on the test. If you cannot define the concepts associated with with any one section, it is unlikely that you will be able to answer the questions contained in that section. You should therefore skip that section, and go on to the next. If you cannot define any of the concepts in the first section, you need not go any further. Simply hand the unanswered test back to your instructor.

The final section of the test (Section 7) consists of one question which requires knowledge of all the other sections in order to be answered adequately. It too should be skipped, unless you have been able to answer the greater part of the questions asked on this test.

SECTION 1

1. Define as many of the following concepts as possible:

Gestalt Life space Insight learning	Section 2
Open education	Section 3
Expository instruction Discovery learning Heuristic	Section 4
Humanistic education Confluent education I-messages Invitational learning	Section 5
Information processing Recognition Attention	Section 6

Organization
Meaningfulness
Ridiculous association
Mnemonic devices
Metacognition.
Transfer

Section 6

SECTION 2

2. How do Gestalt psychologists explain the process of learning?

3. According to Gestalt psychologists, what factors imfluence human perception?

4. Describe at least one of Wolfgang Kohler's experiments on problem-solving.

5. Explain the importance of insight to learning, and describe the conditions necessary for insight to develop.

6. Describe Morris Bigge's application of Gestalt principles to education.

SECTION 3

7. Describe the basic assumptions that Piaget makes about children's motivation to learn, and the use of rewards in learning.

8. Which aspects of open education are in harmony with Piaget's analysis of stages of cognitive development?

9. Describe strengths and weaknesses of open education.

SECTION 4

10. Give three reasons why Bruner objected to the employment of expository instruction in conventional schooling.

11. According to Bruner, how do humans attend to and interpret stimuli?

12. Describe the main principles of the discovery approach, as advocated by Bruner.

13. List the four steps involved in problem-solving.

14. Describe the principles of discovery learning built into "Man: A Course of Study" (MACOS).

15. List the strengths and weaknesses of discovery learning, and state the circumstances under which it can and cannot be used effectively.

SECTION 5

16. What factors led to the rise in popularity of humanistic education, and to its eventual decline?

17. State the cardinal principle of humanistic education.

18. What is Maslow's basic philosophy of education and child-rearing?

19. What characteristics did Combs and Rogers consider desirable for teachers to possess?

20. Why did C.H. Patterson stress a humanistic approach to education?

21. Describe the essence of Teacher Effectiveness Training, as advocated by Thomas Gordon, and list 5 factors that Gordon considers to be characteristic of favourable teacher-student relationships.

22. What does Gordon recommend as the key to solving classroom problems?

23. What does William Purkey consider to be the principle determinant of learning?

24. Describe three learning outcomes encouraged by humanistic educators, and name the techniques suggested to bring them about.

25. What is the humanistic attitude towards traditional grading? Explain this attitude and the alternatives suggested.

SECTION 6

26. Name the two types of mechanisms in the brain involved in processing information.

27. Describe the nature and capacity of:
- the sensory register
- the short-term memory
- the long-term memory

28. Name the 5 main control processes caried out by the structures. What overall function do these control processes serve?

29. Explain the role in memory of the following processes:
- recognition
- attention
- organization
- meaningfulness
- ridiculous association
- verbal and physical activity
- mnemonic devices

30. On what does the improvement of memory primarily depend? Explain the reciprocal relationship of these factors.

31. List 5 factors which function as effective attention-getters.

32. Why are mnemonic devices useful?

33. Provide examples of advantages and disadvantages of teaching students to use mnemonic devices.

34. Can certain aspects of retrieval be examined independently of encoding? Explain your answer.

35. Provide 4 retrieval related reasons for why humans forget.

36. Suggest 4 ways to minimize forgetting.

37. Explain the significance of metacognition to learning theorists.

38. List the steps in a basic learning strategy sequence and state how it can be adapted for use with young children.

39. Describe age trends in metacognition, and adjustments that should be made when using learning strategies with pupils of various ages.

40. List and describe as many different types of transfer as you know.

41. Describe techniques you might use to encourage transfer in the classroom.

SECTION 7

Consider everything you know about Cognitive, Humanistic and Information Processing theories of learning. Use this knowledge to suggest the classroom teaching strategies you might employ to teach the concept of fractions to Grade 3 students.

COGNITIVE POST-TEST

1. Which of the following most clearly illustrates the significance of the word Gestalt?

   1. A boy connects a voice with a face.
   2. A girl feels she has seen or experiences something before it actually happens.
   3. A girl notices that the music she is learning follows a predictable pattern.
   4. Students associate school bells with dismissal.

2. A baseball player and a glassblower interpret the following statement in entirely different ways: "Our pitchers crack in this heat; if we had more fans we would all feel better." Which of the following Gestalt principles best explains this difference in interpretation?

   1. Interpretations are influenced by experiences and interests.
   2. Interpretations are influenced by the context of the statement.
   3. Interpretations are influenced by the law of proximity.
   4. Interpretations are influenced by the way stimuli are arranged.

3. According to Gestalt Learning Theory, the way one experiences the world of objects or events is through

   1. organization.
   2. assimilation.
   3. perception.
   4. knowledge of forms.
   5. meaningfulness.

4. Which of the following is not an application of Gestalt principles to education?

   1. Using discussions.
   2. Introducing disturbing data.
   3. Permitting students to make mistakes.
   4. Switching subject matter.
   5. Rehearsing material.

5. Which of the following best characterizes Piaget's view of children's motivation to learn?

   1. Children are more motivated to learn when materials are arranged and presented by others.
   2. Children need both extrinsic and intrinsic rewards to maintain motivation.
   3. Children need to work toward the attainment of a concrete reward.
   4. Learning is its own reward.

6. A teacher using the discovery approach as advocated by Bruner would

   1. teach students how to solve problems in prescribed ways.
   2. ask students to propose solutions to problems.
   3. acquaint students with famous inventions.
   4. urge students to read about how great discoveries were made.

7. Which of the following groups of students is least likely to benefit from the use of discovery techniques?

   1. High school students from disadvantaged homes.
   2. High school students with a high need for achievement.
   3. Junior high students with low need for achievement.
   4. Primary grade students from disadvantaged homes.

8. Teaching <u>heuristics</u> would be most appropriate if you were instructing

   1. a primary grade class in arithmetic.
   2. a primary grade class in language arts.
   3. a junior high school class in typing.
   4. a senior high school class in physics.

9. Which of the following is <u>not</u> a stage in the process of discovery?

   1. Verification.
   2. Incubation.
   3. Preparation.
   4. Assimilation.
   5. Illumination.

10. When is it appropriate to use open education techniques?

    1. When superficial understanding of many topics is needed.
    2. When students will be taking standardized achievement tests.
    3. When teaching disadvantaged students.
    4. When goals include more than academic achievement.

11. Having students jot down ideas prior to discussion is a way of allowing for which of the following types of pupil differences?

    1. cognitive style.
    2. cognitive development.
    3. anxiety level.
    4. interpersonal skills.

12. Which of the following is <u>not</u> a main feature of open education?

    1. team teaching.
    2. child as active participant.
    3. open space.
    4. elaborative rehearsal.
    5. diagnostic evaluation.

13. According to Bruner, the most important goal of school learning is

    1. discipline.
    2. understanding.
    3. relevance.
    4. insight.

14. Bruner believes that expository instruction

    1. encourages memorization and is the basis for learning.
    2. encourages children to develop symbolic thinking.
    3. encourages memorization without true understanding.
    4. organizes subject matter into artificial components.
    5. gives students a deeper understanding of what they have studied.

15. Which of the following statements made by a student most clearly represents learning as viewed by Gestalt theorists?

    1. "I would learn more if the teacher would just give me some attention."
    2. "Let's see, it's 'i before e, except after c'."
    3. "When I finish this workbook exercise, I'll earn 10 points."
    4. "Ah--now I see how it goes together."

16. Mr. Smith says that he runs a humanistic class. Which of the following of his educational objectives is <u>not</u> fundamental to most humanistic approaches to education?

    1. To emphasize consideration of the feelings of students.
    2. To develop a student's own desire to learn.
    3. To let a student choose the things he/she wants to learn.
    4. To develop external and objective standards of evaluation.

17. What is the role assigned to teachers in humanistic education?

    1. Information giver.
    2. Surrogate parent.
    3. Facilitator.
    4. Peer.

18. Humanistic education places most emphasis on which of the following abilities?

    1. Knowledge of the major realms of human thought.
    2. Ability to use the higher intellectual process in problem solving.
    3. Self-acceptance, flexibility, and self-actualization.
    4. Ability in at least one of the performing arts.

19. Which of the following words most clearly sums up Maslow's advice to teachers?

    1. Direct.
    2. Guide.
    3. Help.
    4. Lead.

20. Teachers who use a learner-centered approach as advocated by Rogers should possess all of the following qualities <u>except</u>

    1. confidence in their abilities to teach effectively.
    2. empathic awareness of student feelings.
    3. prizing of students as individuals.
    4. trust in the capacity of students to develop their own potential.

21. Thomas Gordon (who advocates teacher effectiveness training) urges teachers to solve classroom problems by first

    1. appointing a student committee to suggest appropriate action.
    2. determining who "owns" the problem.
    3. having students prepare individual reward menus.
    4. isolating the cognitive from the affective aspects of the problem.

22. Which of the following is <u>not</u> mentioned in the text as an explanation for the decline of enthusiasm of humanistic education?

    1. Emergence of technological forms of instruction such as programmed learning.
    2. Low student achievement test scores.
    3. Stablilization of the social and political climate.
    4. Shift to political conservatism.

23. Claims that values clarification will lead students to "live more meaningful lives" can be questioned on the grounds that

    1. not enough values clarification strategies have been proposed.
    2. basic procedures have not been spelled out.
    3. teachers do not use the technique consistently enough.
    4. the values clarified will not necessarily lead to sound choices.

24. The cardinal principle of communication noted in the text is most similar to

    1. confluent education.
    2. an I-message.
    3. invitational learning.
    4. values clarification.

25. What basic principle is shared by humanistic and cognitive learning theories?

    1. That affective aspects of behaviour influence learning.
    2. That teachers should arrange the learning environment to permit students to make their own discoveries.
    3. That how students encode, store, process and retrieve information influences learning.
    4. That teachers should use expository teaching to increase learning.

26. The information processing approach to analyzing cognitive functioning stresses all of the following <u>except</u>:

    1. encoding.
    2. retrieval.
    3. reinforcement.
    4. storage.

27. The sensory register

    1. holds up to seven bits of information for further processing
    2. is essentially the same as short-term memory.
    3. registers stimuli very briefly before they are processed further.
    4. registers sense impressions in more or less permanent form.

28. As you read this question, you will pick out an option that you decide is correct. Your mental processes as you do this can best be explained by which of these concepts proposed by information processing theorists.

    1. Attention.
    2. Chunking.
    3. Recognition.
    4. Maintenance rehearsal.

29. Which of the following sets includes all of the attention-getters described in Chapter 10?

1. Color, size, intensity, familarity, suddenness.
2. Color, size, intensity, novelty, unexpectedness.
3. Color, size, novelty, unexpectedness, meaningfulness.
4. Size, intensity, repetition, familiarity, vividness.

30. Which of the followng best illustrates maintenance rehearsal?

1. Associating new material with something already known.
2. Organizing information into categories.
3. Repeating material over and over.
4. Studying a subject for an hour each day.

31. An elementary grade pupil who is in the process of learning new vocabulary turns in a report in which he notes that farmers in some states have to irritate their fields to make things grow. This statement most clearly illustrates which of these explanations for forgetting?

1. Disuse.
2. Reorganization.
3. Repression.
4. Retroactive inhibition.

32. You have just taught young Andrew that a unicorn's horn is called a sclig and that certain principles of the unicorn's existence have application to the lives of other animals. One year later, you would expect young Andrew to have

1. forgotten the technical name of the unicorn's horn and the princples.
2. forgotten the technical names of the unicorn's horn but remembered the princples.
3. remembered the technical name of the unicorn's horm but forgotten the principles.
4. remembered the technical name of the unicorn's horn and the principles.

33. Memory experts Lorraine and Lucas reveal the "secret" of the memory feats they perform on

1. chunking.
2. maintenance rehearsal.
3. physical activity.
4. ridiculous associations.

34. You have difficulty in remembering a friend's phone number you just looked up in the directory. You turn your attention to something else briefly and then realize you have to look up the number again. In which component of the information-processing model of memory did forgetting occur?

1. sensory storage system.
2. long-term memory.
3. short-term memory.
4. encoding device.

35. Which of the following is <u>not</u> a control that governs the flow of information between the memory stores

1. recognition.
2. attention.
3. retrieval.
4. elaborate rehearsal.
5. sensory registration.

36. Given a grade three class learning multiplication tables which of the following learning theories would most aptly apply?

1. Open Education.
2. Humanistic Education.
3. Information Processing.
4. Discovery Learning.

37. How many bits of information can be stored in short-term memory for about 20 seconds?

1. 1-3.
2. 2-5.
3. 5-9.
4. 8-12.
5. 10-15.

38. Research generally supports the claim that retrieving information from long-term memory depends mostly on the

1. time between storage and recall.
2. strength of the memory trace.
3. cues used to evoke the stored information.

39. The purpose of chunking is to

1. increase attention span.
2. increase comprehension of meaningful material.
3. increase the capacity of long-term memory.
4. increase the efficiency of short-term memory.

40. Advantages of mnemonic devices stressed in the text include all but which of the following?

1. They help organize what is to be learned.
2. They facilitate maintenance rehearsal.
3. They provide retrieval cues.
4. They can be acquired by virtually all students.

BONUS (1 POINT)

Following is a list of practical applications -- Put a 1 beside each one that is an example of an Information Processing Technique, a 2 beside each one that is a technique from Cognitive Learning Theory and a 3 beside those that represent Humanistic applications.

_____ Students are encouraged to relate new subject matter with what they already know.

_____ Children are provided with opportunities to interact with objects.

_____ Distributed practice techniques are encouraged.

_____ Values clarification strategies are used.

_____ Students are encouraged to see the structure of content and relationship among its elements.

Which of the following orders of numbers represents the above list of practical applications?

A. 3, 1, 2, 2, 1

B. 2, 2, 1, 1, 3

C. 1, 2, 1, 3, 2

D. 2, 3, 1, 2, 1

C210 - INSTRUCTIONAL DESIGN

PRETEST 1

YOUR ANSWERS TO THE QUESTIONS BELOW WILL GREATLY HELP US IN DESIGNING AN INSTRUCTIONAL UNIT THAT IS SUITED TO YOUR NEEDS AND EDUCATIONAL GOALS. ALL THE INFORMATION YOU GIVE WILL BE COMPLETELY CONFIDENTIAL.

SECTION A

Please circle the number that best corresponds to your level of agreement or disagreement with the statement. Either you agree (1), agree somewhat (2), don't know (3), disagree somewhat (4), or disagree (5).

	Agree				Disagree
1. Students tend to learn more by working together than they do by working alone.	1	2	3	4	5
2. Students can learn as much from each other as they can from a teacher.	1	2	3	4	5
3. Giving a group grade is an unfair way of evaluating students.	1	2	3	4	5
4. It is important for teachers to know how to cooperate with others in their work.	1	2	3	4	5
5. A good teacher must understand how children learn.	1	2	3	4	5
6. Competition in the classroom motivates students to work harder than they would otherwise do.	1	2	3	4	5
7. When doing an assignment, two heads are better than one.	1	2	3	4	5
8. In the real world, people have to compete with each other more than they have to cooperate.	1	2	3	4	5
9. The best students in the class will tend to receive lower grades in groups than they would normally receive for individual work.	1	2	3	4	5
10. If students did not have to compete with each other for grades, they would not work as hard.	1	2	3	4	5

11. It is more enjoyable to spend class time working in small groups than it is to listen to a lecture.	1	2	3	4	5
12. Studying various psychological theories of learning is a valuable activity for students who intend to become teachers.	1	2	3	4	5
13. Working with others is an important skill which should be taught at schools and universities.	1	2	3	4	5
14. Group work is not appropriate for university students.	1	2	3	4	5
15. Group grades are not an accurate measurement of the work done by each individual in the group.	1	2	3	4	5
16. Group work enables students to accomplish more in a short time.	1	2	3	4	5
17. Group work decreases the work load of each student.	1	2	3	4	5
18. The problem with group work is that a few students inevitably end up doing the bulk of the work, while others contribute little or nothing to the task.	1	2	3	4	5

For the following questions, please continue to circle <u>one</u> answer only.

19. Success in individual work depends <u>most</u> on:
    a. the student's ability
    b. how difficult the task is
    c. luck
    d. how hard the individual works.

20. Success in group work depends <u>most</u> on:
    a. how difficult the task is
    b. the ability of the group members
    c. group interaction and cohesion
    d. luck

SECTION B

For each of the following topics, please circle the number that best corresponds to your present knowledge (how much you know) and your desired knowledge level (how much you would like to know).
0 = Nothing at all 5 = Average amount 10 = A great deal.

1. Cognitive theories of learning (e.g. Gestalt Psychology, open education, discovery learning, meaningful reception learning)

PRESENT:	0	1	2	3	4	5	6	7	8	9	10
DESIRED:	0	1	2	3	4	5	6	7	8	9	10

2. The humanistic approach to teaching and learning (e.g. Maslow, Rogers, Combs, Confluent education, Teacher Effectiveness Training, self concept theory, values clarification)

PRESENT:	0	1	2	3	4	5	6	7	8	9	10
DESIRED:	0	1	2	3	4	5	6	7	8	9	10

3. How information is processed by the brain (e.g. the sensory register, long term/short term memory, control processes, mnemonics, metacognition)

PRESENT	0	1	2	3	4	5	6	7	8	9	10
DESIRED:	0	1	2	3	4	5	6	7	8	9	10

You will probably have been involved in some group work in the past, if not in this course then in others. On a scale of 1 - 10 (where 1 = poor, 5 = average, and 10 = excellent) rate your present ability and your desired ability in the following group work skills:

1. Listening to others

PRESENT:	1	2	3	4	5	6	7	8	9	10
DESIRED:	1	2	3	4	5	6	7	8	9	10

2. Sharing your ideas in a group

PRESENT:	1	2	3	4	5	6	7	8	9	10
DESIRED:	1	2	3	4	5	6	7	8	9	10

3. Asking probing questions

PRESENT:	1	2	3	4	5	6	7	8	9	10
DESIRED:	1	2	3	4	5	6	7	8	9	10

4. Offering helpful and unoffensive criticism

PRESENT:	1	2	3	4	5	6	7	8	9	10
DESIRED:	1	2	3	4	5	6	7	8	9	10

5. Participation	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10
6. Encouraging others to share their ideas	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10
7. Compromising	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10
8. Providing support for others	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10
9. Giving praise for good ideas	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10
10. Cooporating	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10
11. Helping others	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10
12. Accepting others' ideas	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10
13. Displaying positive feelings towards other group members	PRESENT:	1	2	3	4	5	6	7	8	9	10
	DESIRED:	1	2	3	4	5	6	7	8	9	10

SECTION C PERSONAL INFORMATION

1. Name: _____

2. Sex: Male ☐ Female ☐

3. Age: 18 - 25 ☐
26 - 35 ☐
36 - 55 ☐

4. How much previous experience have you had with working in small groups?

A great deal ☐
A fair amount ☐
A little ☐
None at all ☐

5. Do you enjoy working in groups? Why/Why not?

6. What situations (outside of this course) might require you to work in groups with others?

7. What situations (outside of this course) might require you to know various learning theories?

C210 - INSTRUCTIONAL DESIGN POST-QUEST

YOUR ANSWERS TO THE QUESTIONS BELOW WILL FURTHER HELP US IN DESIGNING AN INSTRUCTIONAL UNIT THAT IS SUITED TO THE NEEDS AND EDUCATIONAL GOALS OF C210 STUDENTS. ALL THE INFORMATION YOU GIVE WILL BE COMPLETELY CONFIDENTIAL.

SECTION A

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	Agree				Disagree
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3. Giving a group grade is an unfair way of evaluating students.	1	2	3	4	5
4. It is important for teachers to know how to cooperate with others in their work.	1	2	3	4	5
5. A good teacher must understand how children learn.	1	2	3	4	5
6. Competition in the classroom motivates students to work harder than they would otherwise do.	1	2	3	4	5
7. When doing an assignment, two heads are better than one.	1	2	3	4	5
8. In the real world, people have to compete with each other more than they have to cooperate.	1	2	3	4	5
9. The best students in the class will tend to receive lower grades in groups than they would normally receive for individual work.	1	2	3	4	5
10. If students did not have to compete with each other for grades, they would not work as hard.	1	2	3	4	5

11. It is more enjoyable to spend class time working in small groups than it is to listen to a lecture.	1	2	3	4	5
12. Studying various psychological theories of learning is a valuable activity for students who intend to become teachers.	1	2	3	4	5
13. Working with others is an important skill which should be taught at schools and universities.	1	2	3	4	5
14. Group work is not appropriate for university students.	1	2	3	4	5
15. Group grades are not an accurate measurement of the work done by each individual in the group.	1	2	3	4	5
16. Group work enables students to accomplish more in a short time.	1	2	3	4	5
17. Group work decreases the work load of each student.	1	2	3	4	5
18. The problem with group work is that a few students inevitably end up doing the bulk of the work, while others contribute little or nothing to the task.	1	2	3	4	5

For the following questions, please continue to circle one answer only.

19. Success in individual work depends most on:
    a. the student's ability
    b. how difficult the task is
    c. luck
    d. how hard the individual works.

20. Success in group work depends most on:
    a. how difficult the task is
    b. the ability of the group members
    c. group interaction and cohesion
    d. luck

SECTION B

For each of the following topics, please circle the number that best corresponds to your knowledge of that topic (i.e., how much you know about it).

0 = Nothing at all 5 = Average amount 10 = A great deal.

1. Cognitive theories of learning (e.g. Gestalt Psychology, open education, discovery learning, meaningful reception learning)
   0 1 2 3 4 5 6 7 8 9 10
2. The humanistic approach to teaching and learning (e.g. Maslow, Rogers, Combs, Confluent education, Teacher Effectiveness Training, self concept theory, values clarification)
   0 1 2 3 4 5 6 7 8 9 10
3. How information is processed by the brain (e.g. the sensory register, long term/short term memory, control processes, mnemonics, metacognition)
   0 1 2 3 4 5 6 7 8 9 10

By now, you will probably have been involved in some group work, if not in this course then in others. On a scale of 1 - 10 (where 1 = poor, 5 = average, and 10 = excellent) rate your present ability to perform each of the following group work skills:

1. Listening to others 1 2 3 4 5 6 7 8 9 10
2. Sharing your ideas in a group 1 2 3 4 5 6 7 8 9 10
3. Asking probing questions 1 2 3 4 5 6 7 8 9 10
4. Offering helpful and unoffensive criticism 1 2 3 4 5 6 7 8 9 10
5. Participation 1 2 3 4 5 6 7 8 9 10
6. Encouraging others to share their ideas 1 2 3 4 5 6 7 8 9 10

7. Compromising	1	2	3	4	5	6	7	8	9	10
8. Providing support for others	1	2	3	4	5	6	7	8	9	10
9. Giving praise for good ideas	1	2	3	4	5	6	7	8	9	10
10. Cooperating	1	2	3	4	5	6	7	8	9	10
11. Helping others	1	2	3	4	5	6	7	8	9	10
12. Accepting others' ideas	1	2	3	4	5	6	7	8	9	10
13. Displaying positive feelings towards other group members	1	2	3	4	5	6	7	8	9	10

SECTION C PERSONAL INFORMATION

1. Name: _____

2. To what extent have you spent time outside of class this semester, studying the course content covered in C210 with other students?

   - A great deal ☐
   - A fair amount ☐
   - A little ☐
   - None at all ☐

3. Do you enjoy working in groups? Why/Why not?

4. What situations (outside of this course) might require you to work in groups with others?

5. What situations (outside of this course) might require you to know various learning theories?

PLEASE NOTE: YOUR RESPONSES TO ALL QUESTIONS WILL BE **COMPLETELY CONFIDENTIAL**

Find your own name on the class list provided. You will notice that your name corresponds to a number in the left-hand margin. Write down your number in the space provided:

_____

It is essential that your answers to the following questions are accurate. For each question, you have been provided with enough spaces to enter **three** student numbers. You may enter **less** than three numbers where appropriate, but you may **not** enter more than three numbers for any single question. If you do not know anyone who fits the description suggested by the question, simply enter zero (0) in all three spaces provided for that question.

1. Who do you interact with best in this course?

   a. ___
   b. ___
   c. ___

2. Which students (if any) do you socialize with outside of class time?

   a. ___
   b. ___
   c. ___

3. Which students (if any) do you work with on assignments for this course?

   a. ___
   b. ___
   c. ___

4. If placed in a group who would you most want to work with?

   a. ___
   b. ___
   c. ___

5. Which students (if any) did you know before taking this course. (More than three answers allowed)

   ___ ___
   ___ ___
   ___ ___

LESSON EVALUATION SHEET Date: _____

Please circle the most appropriate alternative.

1. CLARITY
The concepts and objectives were:
1. unclear
2. somewhat unclear
3. somewhat clear
4. clear

2. HELPFUL
The materials and activities were:
1. unhelpful
2. somewhat unhelpful
3. somewhat helpful
4. helpful

3. INTEREST
I found the lesson:
1. uninteresting
2. quite uninteresting
3. quite interesting
4. interesting

4. LEARNED
I learned:
1. nothing
2. very little
3. a fair amount
4. a great deal

5. PACE
The lesson progressed:
1. much too fast
2. a little too fast
3. just right
4. a little too slow
5. much too slow

6. ANXIETY
The learning environment made me feel:
1. uncomfortable
2. somewhat uncomfortable
3. somewhat comfortable
4. comfortable

7. AMOUNT
The number of materials and activities provided was:
1. much too few
2. a little too few
3. just right
4. a little too much
5. much too much

Please use the back of this sheet to answer questions 8-10:

8. Please note any specific problems you had with the materials.

_____

_____

9. Please note any specific problems you had with the learning activities.

_____

_____

10. What improvements would you suggest for this lesson?

INSTRUCTOR EVALUATION OF LESSON

You are requested to observe student reactions to handouts, tasks, materials, media and teacher explanations during the course of the lesson. Use the matrix provided to record any problems which arise, as well as any successes you observe: Each of the characteristics included in the matrix corresponds to a question which you should ask yourself when rating each activity contained in the lesson. These questions are illustrated below:

Miscomprehension:	Do questions asked by students indicate miscomprehension of the concepts? Is there any evidence that the logic of the lesson's progression is not grasped by students?
Confusion:	Is there confusion at any point in the lesson?
Unclear:	Are the materials/tasks inadequately explained, as evidenced by student requests for further clarification?
Struggle:	Do the students struggle with any of the tasks or concepts, e.g., peer tutoring?
Expected responses:	Do the students come up with the responses expected of them?
Participation:	Do students participate where expected to?
Interest:	Do students seem interested in the material?
Too difficult: *Too easy:*	Do students complain that tasks are too difficult or too easy?
Appropriate:	Do students comment on the appropriateness of the materials/tasks?
Attractive:	Do students comment on the attractiveness of the materials/tasks?
Motivation:	Are students animated and motivated when involved in activities?
Anxiety:	Do any of the activities cause student anxiety?
Student success:	Are tasks successfully completed by students?
Enjoyment:	Is there laughter (where appropriate) or any other signs of student enjoyment of lesson?

LESSON # _____

ACTIVITY

CHARACTERISTIC							
Miscomprehension							
Confusion							
Unclear							
Struggle							
Expected responses							
Participation							
Interest							
Enjoyment							
Too difficult							
Too easy							
Appropriate							
Attractive							
Motivation							
Anxiety							
Student success							

FINAL EVALUATION

Over the past five weeks, you have been involved in a learning experience consisting primarily of cooperative group work. In the following questions, you are asked to evaluate this experience. Your responses should not include your feelings about the rest of this course, nor about the competency of your instructor.

Section A

Please indicate your overall rating of the learning experience by circling the most appropriate response:

1. LEARNED
I learned:
a. nothing
b. very little
c. a fair amount
d. a great deal

2. ENJOYMENT
I found the experience:
a. unenjoyable
b. somewhat unenjoyable
c. somewhat enjoyable
d. enjoyable

3. ORGANIZATION
The experience was:
a. poorly organized
b. quite poorly organized
c. quite well organized
d. well organized

Overall, the learning experience was:

4. PACE
a. much too fast
b. a little too fast
c. just right
d. a little too slow
e. much too slow

5. RELEVANCE
a. irrelevant to my needs
b. somewhat irrelevant to my needs
c. somewhat relevant to my needs
d. relevant to my needs

6. INTEREST
a. boring
b. somewhat boring
c. somewhat interesting
d. interesting

Section B

Please circle the most appropriate response:

Had the past five weeks been taught using a traditional lecture-based approach, in which I would have worked individually,

7. I would probably have learned:
a. more
b. less
c. the same

8. I would probably have enjoyed the classes:
a. more
b. less
c. the same

9. My performance on the mid-term quiz would probably be:
   a. better
   b. worse
   c. the same

10. I would probably have found the subject matter:
   a. more interesting
   b. less interesting
   c. equally interesting

11. I would probably have been ___ motivated to do my best:
   a. more
   b. less
   c. the same

12. I would probably have attended classes:
   a. more frequently
   b. less frequently
   c. the same amount

Section C

Please answer the following questions:

13. Would you recommend that we use this type of cooperative learning experience with future students in this course? Why/Why not?

14. What aspects of the learning experience did you gain **most** from?

15. What aspects of the learning experience did you gain **least** from?

16. What improvements would you recommend?

FINAL EVALUATION

In the following questions, you are asked to evaluate your learning experience in this course over the past 5 weeks. Please note that your responses should **not** include your feelings about the rest of this course, nor about the competency of your instructor.

Section A

Please indicate your overall rating of the learning experience by circling the most appropriate response:

1. LEARNED
I learned:
a. nothing
b. very little
c. a fair amount
d. a great deal

2. ENJOYMENT
I found the experience:
a. unenjoyable
b. somewhat unenjoyable
c. somewhat enjoyable
d. enjoyable

3. ORGANIZATION
The experience was:
a. poorly organized
b. quite poorly organized
c. quite well organized
d. well organized

Overall, the learning experience was:

4. PACE
a. much too fast
b. a little too fast
c. just right
d. a little too slow
e. much too slow

5. RELEVANCE
a. irrelevant to my needs
b. somewhat irrelevant to my needs
c. somewhat relevant to my needs
d. relevant to my needs

6. INTEREST
a. boring
b. somewhat boring
c. somewhat interesting
d. interesting

Section B

Please circle the most appropriate response:

Had the past five weeks been taught using a cooperative group learning approach, in which I would have covered the material by working in small groups with other students, and had less lecturing from the instructor,

7. I would probably have learned:
a. more
b. less
c. the same

8. I would probably have enjoyed the classes:
a. more
b. less
c. the same

9. My performance on the mid-term quiz would probably be:
   a. better
   b. worse
   c. the same

10. I would probably have found the subject matter:
   a. more interesting
   b. less interesting
   c. equally interesting

11. I would probably have been ___ motivated to do my best;
   a. more
   b. less
   c. the same

12. I would probably have attended classes:
   a. more frequently
   b. less frequently
   c. the same amount

Date: _____

GROUP PROCESS SHEET - INDIVIDUAL

Please rate your performance today in the following areas:

To what extent did you:	None of the time	Hardly ever	Some times	Most of the time	All of the time
Contribute ideas to the end goal	1	2	3	4	5
Accept the ideas of other group members	1	2	3	4	5
Stay on topic	1	2	3	4	5
Feel open & free to express your thoughts	1	2	3	4	5
Display positive feelings towards others	1	2	3	4	5
Offer help to others	1	2	3	4	5
Feel comfortable enough to ask for help	1	2	3	4	5
Cooperate with others	1	2	3	4	5
Provide praise for good ideas	1	2	3	4	5
Compromise	1	2	3	4	5
Offer helpful and unoffensive criticism	1	2	3	4	5
Provide support for others	1	2	3	4	5
Listen to others	1	2	3	4	5

Please answer the following questions by circling the appropriate number:

	VERY LITTLE	LITTLE	SOMEWHAT	QUITE A BIT	VERY MUCH
To what extent did others pay attention to and ask for your ideas?	1	2	3	4	5
How satisfied do you feel with your group's performance?	1	2	3	4	5
How included do you feel in your group?	1	2	3	4	5

Did your group complete the tasks? 1 YES 2 NO

Appendix B

Behavioral Objectives

TERMINAL PERFORMANCE OBJECTIVE #1

Given any classroom situation for which the learners, content, and objectives have been specified, but for which no teaching strategies have been designated, the students will prescribe "appropriate" teaching strategies, based on Cognitive, Humanistic, and Information Processing learning theories, and suitable for the classroom situation in question. Below is a criterion check list for "appropriate" teaching strategies:

	YES	NO
* Are the strategies prescribed appropriate for the characteristics (age, entry level skills, abilities, etc.) of the learners?		
* Are the strategies suggested appropriate for the specific learning task (i.e., objectives)?		
* Is there an appropriate mix of strategies, drawn from each of the three learning strategies studied?		
* Where a prescription of instructional strategies is required by the situation,		
- does instruction progress from the known to the unknown?		
- are the learners made aware of the structure of the content, and the relationship among its elements?		
- are related concepts grouped close together in time and space?		
- are techniques to emphasize key concepts used?		
- does instruction tap students' interests?		
- are a variety of instructional methods employed (other than lecturing, e.g., hands-on, discussion, demonstration)?		
- are attention-gaining techniques employed?		
- is student participation encouraged?		
- is informed guessing facilitated?		
- are techniques for stimulating curiosity employed?		
- is material presented so as to facilitate recognition?		
- is information organized so as to facilitate chunking?		
- is the subject matter presented in a context/way that is meaningful for the students?		
* Where a prescription of the learning environment is required by the situation,		
- does the arrangement of the learning environment facilitate insight and discovery through the provision of sufficient materials and ideas to manipulate?		
- is a pleasant, non-threatening learning environment established?		
* Where a prescription of learning activities is required by the situation,		
- are students provided with sufficient opportunities to interact with objects, ideas and each other?		
- are role-playing, simulation games and values clarification techniques employed where appropriate?		
- is the use of mnemonic devices encouraged for material that is difficult to learn?		

	YES	NO
- are verbal and physical activity facilitated?		
- are ridiculous associations encouraged for material that is difficult to learn?		
- is distributed practice enforced?		
- is practice of learned information facilitated?		
- is conflicting subject matter studied at different times?		
- is rote memorization discouraged, and meaningfulness stressed?		
* Where the objectives of the situation center on enhancing creativity, self-esteem, positive attitudes to school, and a deeper understanding, are techniques of open education, discovery learning, and/or humanistic education prescribed?		
* Where the employment of discovery techniques is advocated,		
- is discovery guided?		
- is discovery integrated with expository instruction?		
* Where discussion is advocated, are effective discussion techniques employed?		
* Are students with a low self-concept encouraged to feel more positive about themselves?		
* Are positive teacher-student relationships encouraged,		
- by way of I-messages?		
- by way of establishing problem ownership?		
* Is appropriate stress placed on affective factors (e.g., use of object lessons?		
* Is an appropriate amount of student choice allowed?		
* Is an attitude of inquiry encouraged?		
* Are students encouraged to find their own solutions where appropriate?		
* Does the teacher function as a facilitator (as opposed to directing and controlling learning) where appropriate?		

TERMINAL PERFORMANCE OBJECTIVE #2

Faced with any situational problem that requires cooperative group work for its solution, the learners will collaborate with others in a group, such that they function as "effective" group members. The term "effective group member" refers to an individual who, when working with others, displays the interpersonal and group skills necessary to 1. help the group attain its task, and 2. help the group maintain positive working relationships. Below is a criterion checklist for effective groups:

	YES	NO
* Do group members display commitment to completing the task by avoiding side-tracking?		
* Does each group member contribute equally to the end goal?		
* Does each group member display positive feelings towards the other group members?		
* Do the group members offer help to one another?		
* Do the group members request help from each other?		
* Do the group members cooperate in - scheduling? - work allocation? - definition of group goals? - task execution?		
* Do group members encourage each other to share their ideas?		
* Is there an uninhibited exchange of ideas?		
* Do the group members listen to each other?		
* Is praise provided for good ideas?		
* Is criticism offered both helpful and unoffensive?		
* Are group members receptive to (i.e., accepting of) each other's ideas?		
* Is there compromise?		
* Do group members provide support for each other?		

Three additional criteria may serve as reliable indicators of whether effective interpersonal and group skills are being performed. These include:

* Is the task completed?		
* Do group members feel satisfied with the performance of the group?		
* Do group members feel included in the group?		

PREREQUISITE SKILLS

Subskill Statement from Instructional Analysis	Matching Performance Objective
0.1 Explain Piaget's theory of stages of cognitive development (Chapter 2)	Given any hypothetical learners of any age or grade level, and without references, the students will describe the specific stage of cognitive development characteristic of the learners in question. Their description will correspond to that stage of cognitive development stipulated by Jean Piaget for children of the same age as the learners in question
0.2 Explain age-level characteristics of children aged 3 - 12, and adolescents aged 13 - 18. (Chapter 3)	Given hypothetical learners of any age level, and without references, the students will describe the social, physical, emotional and cognitive characteristics typical of the specific age level of the learners in question. Their descriptions will correspond with those provided in Chapter 3 of their text book.
0.3 Describe the main principles of the Behavioural learning theorists. (Chapter 7)	Without references, the students will describe the main principles proposed by the Behaviourists, in particular, the notion of stimulus-response, the use of reinforcement, and the adhesion to observing external behaviour in order to understand learning. The students' descriptions will correspond with those provided in Chapter 7 of their text book for the concepts in question

NOTE: As indicated by the chapter numbers in parentheses, each of the above skills has been taught prior to the commencement of the present instructional unit. In addition, student acquisition and mastery of these skills will have been tested in mid-term and mid-year examinations by the time instruction of the present unit takes place.

Subskill Statement from Instructional Analysis	*Matching Performance Objective*
A. COGNITIVE THEORIES	
Gestalt Psychology	
1.1 Define Gestalt	Without references, the students will define "Gestalt". Their definition will include that Gestalt means form, pattern or configuration and has to do with relationships.
1.2 Explain the Gestalt view of learning	Without references, the students will explain the Gestalt view of learning. Their explanation will include the fact that learning is influenced by the perception of patterns and relationships, such that we don't merely add together impressions, but, rather, grasp how they are related.
1.3 State that perceptions are influenced by the arrangement of stimuli	Without references, and using their own words, the students will state that perceptions are influenced by the way stimuli are arranged. Their statements will include that proximity, closure, contrast and figure-ground arrangements all serve to influence perception.
1.4 State that perceptions are influenced by past experiences and current interests	Without references, and using their own words, the students will state that perceptions are influenced by past experiences and current interests.
1.5 Explain Kurt Lewin's notion of "life space"	Without references, and using their own words, the students will explain Kurt Lewin's notion of "life space". Their explanation will include Lewin's belief that human behaviour is influenced by positive and negative forces, acting on an individual much like a magnetic field, so that the "life space" consists of everything one needs to know about a person in order to understand his/her behaviour at a specific moment, in a specific psychological environment. It is, therefore, not always possible to draw accurate conclusions about behaviour through observation (as suggested by the

	Behaviourists). Rather, the observer must be "subjective" i.e., see things from the subjects point of view.
1.6 Describe Kohler's experiments on problem-solving	Without references, and using their own words, the students will describe at least one of Kohler's experiments on problem-solving, carried out during W.W.I. Their explanation will include an accurate description of the methods employed and results found in at least one of Kohler's experiments with Sultan and other problem-solving apes.
1.7 Define insight & explain the conditions required for insight to develop	Without references, and using their own words, the students will define insight. Their definition willinclude that insight is that learning which occurs when an organism perceives new relationships, and that for Gestalt psychologists, insight is the essence of learning. In order for insight to develop, previous experiences with the essentials of the problem, and the appropriate arrangement of the environment are required.
1.8 Describe Morris Bigge's application of Gestalt principles to education	Without references, and in their own words, the students will describe Bigge's application of Gestalt principles to education: Their description will include 1. Bigge's advocation that teachers should arrange instruction so that students can participate actively in developing insight by attacking a problem posed by the teacher. 2. Bigge's suggestion of switching the subject matter, introducing disturbing data, and permitting students to make mistakes, as techniques for producing effective discussions.

Piaget's view of cognitive development and Open Education

2.1 State Piaget's basic assumption regarding children's motivation to learn	Without references, and using their own words, the students will state Piaget's basic assumption regarding children's motivation to learn. Their statement will include that Piaget called attention to the possibility of "self-motivated" learning, and that he assumed that children have a built-in desire to learn because they have an innate urge to make sense of what they observe and experience.

2.2 Explain Piaget's attitude to reward (and compare it with the Behaviourist view)	Without references, and in their own words, the students will explain Piaget's attitude to reward. Their explanation will include that to Piaget, learning is its own reward, hence there is no reason to provide rewards for learning, since a child who modifies a conception so that it makes sense will feel a sense of satisfaction in achieving equilibration. This is in direct opposition with the Behaviourist view that children should stimulate learning by presenting questions, and reinforce children when they supply correct responses.
2.3 Explain Piaget's view of how children learn best	Without references, the students will explain Piaget's view of how children learn best. Their explanation will include that child en learn best by doing; that is, by interacting with objects, situations and each other. As they do this, they form their own self-rewarding conceptions of things which, according to the Cognitive view, are more meaningful and permanent than ideas acquired through memorizing material arranged and presented by others
List & 2.4 Describe the seven main features of Open Education	Without references, the students will list the seven main features of Open Education. Their list will include: open space, materials to manipulate, multi-age grouping, child as active-participant in his/her own learning, individualized instruction, diagnostic education and team teaching. The students will provide a short and accurate description of each of the above.
2.5 Name those aspects of Open Education that are in harmony with Piaget's analysis of stages of cognitive development	Without references, and using their previously acquired knowledge of Piaget's analysis of cognitive development, the students will explain that, owing to differences in the concrete and pre-operational thinking of young children, and the formal operational thinking of teachers, it is beneficial for pupils (who are at the same cognitive level and who therefore think the same way) to explain things to each other, to choose many of their own learning experiences, and to develop their own learning materials.

2.6 Describe weaknesses of Open Education	Without references, and using their own words, the students will describe the weaknesses attributed to Open Education. Their description will include that Open Education is not as effective as conventional, teacher-directed instruction in producing so-called "measured achievement", and that as a result of the current stress on improving academic performance of school children, Open Education techniques are less popular today than they were 10 years ago.
2.7 Describe strengths of Open Education	Without references, and in their own words, the students will describe the strengths of Open Education. Their description will include that Open Ed. is more effective than conventional instruction at enhancing creativity, self-esteem, and positive attitudes to school. In addition, Open Education students seem to have a deeper understanding of what they have studied and are more likely to continue to learn outside of school

Bruner's theory of cognitive development and education:Discovery Learning

3.1 Define expository instruction	Without references, and in their own words, the students will define expository instruction as consisting of lectures, demonstrations, and other organized information presentations.
3.2 Explain Bruner's objections to conventional schooling employing expository instruction	Without references, and in their own words, the students will explain Bruner's objections to the use of expository instruction in conventional schooling. Their explanations will include: 1. Bruner's belief that expository instruction encourages memorization without true understanding or ability to apply their knowledge, and 2. Bruner's belief that in order to understand extended expository instruction meaningfully, it is necessary for students to be able to represent knowledge symbolically, an ability in which only few student ever become highly skilled.
3.3 Explain Bruner's notion of discovery learning	Without references, and in their own words, the students will include that for Bruner, meaningful learning is

	developed through discoveries that occur during exploration, motivated by curiosity. Learners expand knowledge by developing and testing hypotheses. Bruner, therefore advocates instructional methods which encourage and guide students to learn by discovery. He believes that opportunities to manipulate objects induce curiosity, especially in young children, as do activities which encourage students to search, explore, analyze, or otherwise actively process input, rather than merely respond to it.
3.4 Name and explain the four steps in the process of discovery	Without references, and using their own words, the students will name and explain the steps in the process of discovery. These will be expressed as: 1. preparation - the acquisition of knowledge, 2. incubation - a period in which ideas are sorted out, 3. illumination - the "aha!"; the solution draws in sight, & 4. verification - empirical testing of the tentative solution
3.5 Describe the two main principles of discovery learning, and Bruner's rationale for stressing them	Without references, and using their own words, the students will identify the two main principles of discovery learning, and explain Bruner's rationale for stressing them. Their description will include: 1. stress structure - Grasping the overall pattern or structure of a field of study enables students to remember what they learn and comprehend principles that can be applied in a variety of situations. 2. encourage students to find their own solutions - in this way, they not only acquire problem-solving skills, but also confidence in their own learning abilities.
3.6 Describe the principles of discovery learning built into Man: A Course of Study (MACOS)	Without references, and using their own words, the students will describe the principles of discovery learning built into MACOS. These will include: 1. emphasizing contrast 2. stimulating informed guessing 3. encouraging participation 4. arousing awareness

3.7 Describe strengths of discovery learning and the circumstances under which it can be used effectively	Without references, and using their own words, the students will describe strengths of the discovery approach as being similar to those of Open Ed., namely, that students tend to have a deeper understanding of what they have studied, are more inclined to learn outside school and that students become capable of asking their own questions and seeking their own answers. They should add that discovery methods are useful when 1. students have the necessary motivation and skills, 2. it is important that students develop operative knowledge in addition to figurative knowledge, 3. students need to be able to apply and not merely understand learnt principles, and 4. objectives involve problem-solving or creativity.
3.8 Describe weaknesses of the discovery approach, and the circumstances under which it should not be used	Without references, and using their own words, the students will describe weaknesses in the discovery approach, and the circumstances under which it should not be used. Their description should include problems with the approach such as: 1. the precarious role of the teacher who must avoid direct participation in discussions, & withold information, 2. the inefficiency of discovery - rare and time consuming, 3. interpersonal problems during discovery sessions, 4. the student as teacher may not do a good job, 5. inappropriateness of discovery with primary grades or disadvantaged students who lack wide experience and may not be strongly motivated to learn; less capable students tend to get discouraged, and 6. ineffectiveness of discovery. Consequently, total reliance on discovery approaches is rarely, if ever feasible.

Applications (to teaching) of Cognitive theories

4.1 Match specific classroom applications of cognitive principles with the base-line theories	Given a scenario in which cognitive theories are depicted applied to teaching, and a list of the key cognitive theories covered, the students will match each application with its appropriate base-line theory.

4.2 Identify general classroom applications of cognitive learning theories

Given a number of examples of specific classroom applications of cognitive principles, and a list of the key cognitive theories, the students will identify the general applications suggested by the baseline theories. These will include the following:

- learners made aware of the structure of the content and the relationship among its elements [1.2]
- related concepts are grouped close together in time and space [1.3]
- highlighting, framing, contrasting & other techniques are used to make visual stimuli and key verbal information stand out as figure against background [1.3]
- instruction progresses from the known to the unknown
- instruction taps student interests [1.4]
- the arrangement of the learning environment facilitates insight development through provision of sufficient practice with materials or discussion topics [1.6, 1.7, 1.8]
- in discussions, subject matter is switched, disturbing data introduced, &/or students permitted to make mistakes [1.8]

- children are provided with opportunities to interact with objects, situations & each other [2.3, 2.4, 2.5]
- rewards are not provided as motivation for learning [2.1, 2.2]
- where the desire is to enhance creativity, self-esteem, positive attitudes to school, deeper understanding and learning outside school, techniques of Open Education are used [2.7]
- where the desire is to produce so-called "measured achievement" only, techniques of Open Education are not used [2.6]

- learners are provided with a variety of educational experiences, other than lecturing (e.g, hands-on, discussions, etc.) [3.2]
- students are involved in doing; manipulation of objects and ideas is encouraged [3.3]
- the arrangement of the learning situation facilitates discovery (discussions, simulations, relaxed atmosphere, centers, etc.) [3.3]

- learners are presented with organizing principles, cause-effect explanations and other aids to help them see how things relate to each other [3.5]
- an attitude of inquiry is encouraged [3.5]
- students are urged to find their own answers; teacher avoids active participation where appropriate [3.5]
- contrast is emphasized, informed guessing stimulated, participation is encouraged and awareness aroused [3.6]
- techniques for stimulating curiosity, such as novelty and surprise, are employed [3.3]
- where the desire is to develop operative knowledge, problem-solving skills, or creativity, and if the students possess the necessary motivation and skills, discovery techniques may be employed [3.7]
- where time is short or where primary grade or disadvantaged students lacking skills or motivation are involved, discovery techniques are not employed [3.8
- total reliance on discovery approaches alone should be avoided. Discovery should be guided and integrated with principles of exposition instruction [3.8]

11.1 List the interpersonal and group skills required for a group to function effectively

Using any references available to them, the students will list the interpersonal and group skills required for a group to function effectively. Their list will include the following skills:

- listening to others
- sharing ideas openly and freely
- offering helpful and unoffensive criticism
- encouraging others to share ideas
- being receptive to (accepting of) others' ideas
- compromising
- providing support for others
- providing praise for good ideas
- cooperating in planning and other aspects of task execution
- helping others
- asking others for help
- displaying positive feeling towards others
- displaying commitment to completing the task (avoid side-tracking)
- contributing equally to the end goal

11.2 Recognize effective groups and ineffective groups by whether the group members display the skills required for the group to function effectively	Given a number of examples and non-examples of effective groups, the students will identify the effective groups. Their identification willl be substantiated by the reasoning that an effective group is made up of members who display the skills listed in 11.1.
11.3 Function as effective group members	Given a number of tasks requiring group work for their solution, the students will function as effective group members. Their behaviour will merit a rating of good or better on each of the interpersonal and group skills in 11.1, rated by the students themselves on a group skills rating sheet.

Subskill Statement from Instructional Analysis	*Matching Performance Objective*
B. HUMANISTIC APPROACHES TO EDUCATION	
5.1 Describe the general thrust of humanistic education	Without references, and using their own words, the students will describe the general thrust of humanistic education. Their description will include that humanistic education agrees with the basic principle of cognitive learning theories, i.e. that teachers should arrange the learning environment to permit students to make their own discoveries. However, humanistic theories propose, in addition, that education should involve also an awareness of emotions and feelings.
5.2 Explain the emergence of humanistic approaches in education (factors leading to enthusiasm for humanistic ed.)	Without references, and using their own words, the students will explain the factors which led to the enthusiasm for humanistic approaches in education. Their explanation will include: 1. the social &political changes of the 60s 2. distrust for those in authority 3. inappropriateness of behaviourist approaches
5.3 State the cardinal principle of humanistic education.	Without references, and using their own words, the students will state that the cardinal principle of humanistic education is to give pupils choices.
5.4 State Maslow's basic philosophy of education and child rearing.	Without references, and in their own words, the students will state Maslow's basic philosophy of education. Their statement will address Maslow's conviction that children should be allowed to make many choices about their own development, and that parents and teachers should <u>let</u> children grow and learn, as opposed to attempting to control or shape the way they grow.
5.5 Describe the desirable characteristics of teachers and education, as described by Rogers.	Without references, and using their own words, the students will describe the desirable characteristics of teachers and education as described by Rogers. Their description will include Rogers' view that teachers should be trusting, sincere, should prize students and empathize with them, and that education should be learner-centered, so that

	students become capable of educating themselves, without teachers.
5.6 State the characteristics of effective teachers, as delineated by Combs.	Without references, and using their own words, the students will state Combs' delineation of effective teachers. Their statement will address Combs' belief that how a person perceives himself is of paramount importance and hence, a basic purpose of teaching is to help each student develop a positive self-concept. Accordingly, teachers should be sensitive, trusting, confident, versatile, and should function as facilitators, helpers, assisters, colleagues and friends to their students.
5.7 Explain why Patterson stressed a humanistic approach to education.	Without references, and using their own words, the students will explain Patterson's stress on humanistic approaches. Their explanation will address Patterson's concern that education had become too technological and de-humanized, and his proposal of humanistic education was therefore as an antidote to technological approaches.
5.8 Define Brown's concept of "confluent" education, and explain the rationale behind it.	Without references, and in their own words, the students will define confluent education as the flowing together of affective and cognitive elements in individual and group learning. The students will explain Brown's rationale for confluent education as lying in his belief that there is no intellectual learning without some sort of feeling, and no feeling without the mind's being somehow involved.
5.9 State the essence of Thomas Gordon's Teacher Effectiveness Training.	Without references, and using their own words, the students will state the essence of Gordon's T.E.T. as being a stress on the importance of favourable teacher-student relationships.
5.10 List the characteristics of favourable teacher-student relationships, as described by Thomas Gordon.	Without references, and using their own words, the students will list the characteristics of favourable teacher-student relationships, as described by Thomas Gordon. Their list will include: 1. openness or transparency 2. caring 3. interdependence 4. separateness and 5. mutual needs meeting

5.11 Describe Gordon's recommendation for solving classroom problems.	Without references, the students will describe Gordon's recommendation for solving classroom problems. Their description will address Gordon's belief that to solve classroom problems teachers should first determine who "owns" the problem.
5.12 Define and explain the use of "I-messages".	Without references, the students will define and explain the use of "I-messages". Their definition/explanation will include that I messages are techniques which allow teachers to deal with student-owned problems, by helping them to convey how they feel about a situation, as opposed to how they feel about a student. I messages tell the students in tangible and concrete ways what is causing the problem for the teacher, while at the same time obeying the cardinal humanistic principle of communication: speak to the situation, not the personality.
5.13 Explain what Purkey sees as the principle determinant of learning.	Without references, the students will explain what Purkey sees as the principle determinant of learning. Their explanation will include that for Purkey, learning depends on how students perceive themselves (i.e., their self-concept) which in turn is influenced by the way teachers react, or fail to react to them.
5.14 Define invitational learning and list the seven skills possessed by invitational teachers.	Without references, the students will define invitational learning as that learning which results from the continuous communication of a verbal or non-verbal message to students that they are responsible, able and valuable. The students will list the seven skills of invitational teachers as: 1. reaching each student 2. listening with care 3. being honest with students 4. being honest with oneself 5. inviting good discipline 6. handling rejection and 7. inviting oneself
5.15 Describe three teaching objectives advocated by humanistic educators and name the suggested techniques which enable them.	Without references, the students will describe three objectives advocated by humanistic educators, and name the techniques which enable them. Their description will include: 1. to encourage students to identify

	and empathize with others, and relate their feelings to those of others. Techniques: Role playing & simulation games. 2. to encourage students to become more aware of and act on their attitudes and values. Techniques: Values clarification strategies. 3. to encourage students to explore their feelings and emotions. Techniques: Sensitivity training and encounter groups.
5.16 Explain the humanistic approach to grading.	Without references, the students will explain the humanistic approach to grading. Their explanation will include the humanistic view that traditional grades should be abolished, since they cause students to feel inferior, and to compete with each other, and they place teachers in the role of authorities and judges. Humanists advocate, instead, pass/fail grading, or relaxed standards in traditional grading.
5.17 Explain the decline popularity of the humanistic approach in education.	Without references, the students will explain the decline in popularity of humanistic education. Their explanation will include the following factors: 1. stabilization of the social and political climates which became more conservative. 2. evidence that students in learner-centered classes scored low on achievement tests caused a "back to basics" movement in educational practices.
5.18 Describe the nine main features of humanistic education.	Without references, the students will describe the nine main features of humanistic education. These will include: 1. assumptions about pupils and the basic nature of education 2. characteristics of effective teachers 3. affective factors explored as much as the cognitive side of subject matter 4. positive teacher-student relationships 5. how students perceive themselves influences the way they learn 6. teachers should encourage students to explore their feelings and emotions 7. students encouraged to identify and empathize with others' feelings

8. teachers should use techniques to make students aware of and act upon their values and attitudes
9. non-traditional grading practices

5.19 Evaluate the current appropriateness of humanistic techniques

Without references, and using all they know about humanistic education, the students will evaluate the current appropriateness of humanistic techniques. Their evaluation will take into account the current stress in education on mastery and "basics", and how the nine features of humanistic education fit or clash with the current climate.

5.19a Explain how humanistic techniques may be modified to better "suit" current educational practices.

Without references, and using all they know about humanistic education, the students will explain how humanistic techniques may be modified to "suit" current educational practices. Their explanation will include the following factors:

- not feasible to let students make <u>all</u> the decisions about their learning, since certain content (notably 3rs) must be covered. Students can manage their learning some of the time, however; contracts are a good structuring technique which still provide student choice
- teacher functions as a guide only some of the time; sometimes necessary to tell students the answers they seek or facts
- a positive teacher-student relationship should be established, but the teacher maintains some distance and does not function as a friend, since this is too risky
- may be unwise to stress affective side of learning in the 80s to the extent advocated by Combs, but should still be explored to get students personally involved in the subject matter
- it is still considered good for teachers to strive to help students develop positive feelings about themselves
- techniques of sensitivity training and encounter groups as techniques for encouraging students to explore their feelings and emotions are held in disdain today, but other techniques may be judiciously used
- encouraging students to be aware of their feelings and those of others, independently of presenting subject matter, is considered problematic by many. Widely accepted, however, when aimed at increasing involvement and

	interest in subject matter - unlikely that values clarification will change students' habits and lives. However, they may provide students with valuable insights,, and may therefore be used judiciously. Other techniques to encourage the development of desired values, such as object lessons and setting an example, may also be used - emphasis on mastery in today's schools means teachers are expected to assign and defend traditional grades that reflect mastery of specific instructional objectives. However, for some activities, it is expedient and acceptable not to give grades, e.g., journals, creative writing, visual arts (in junior grades)
5.20 Identify both modified and unmodified humanistic techniques	Given a classroom scenario containing modified and unmodified humanistic techniques, as wll as other non-humanistic based techniques, the students will identify those which are humanistic. Their identification will include any and all of the humanistic techniques listed in objectives 5.19 and 5.19a.

Subskill Statement from Instructional Analysis	*Matching Performance Objective*
C. INFORMATION PROCESSING	
6.1 Define Information Processing	Without references, the students will define Information Processing as being how humans encode, store, process and retrieve information.
6.2 Name the two types of mechanisms in the brain involved in processing information	Without references, the students will name the two information processing mechanisms in the brain. These will be: 1. the structures 2. control processes
6.3 Define and name the structures	Without references, the students will define and name the structures. Their response will include that the structures are memory stores, which vary in the amount of information they can hold, and for how long. They include: 1. the sensory register 2. the short-term memory 3. the long-term memory
6.4 Define and name the control processes	Without references, the students will define and name the control processes. Their response will include that the control processes govern the flow of information between memory stores and the manner in which it is encoded. The processes are 1. recognition, 2. attention, 3. maintenance rehearsal, 4. elaborative rehearsal, and 5. retrieval
6.5 Describe the nature and capacity of the sensory register	Without references, the students will describe the nature and capacity of the sensory register. Their description will include that the sensory register records the numerous stimuli that constantly bombard our sense receptors. The stimuli are held briefly in the sensory register (1-3 seconds) and considered for possible processing. If attended to, the stimuli are "processed" and transferred to short-term memory. Otherwise, the stimuli simply fade away. The sensory register is so-called because the information is thought to be encoded in the same form it is perceived.

6.6 Describe the nature and capacity of the short-term memory	Without references, the students will describe the nature and capacity of the short-term memory. Their description will include that impressions converted to bits of information in the sensory register are transferred to short-term memory where it is considered for further processing. The short-term memory store is short in length and has a limited capacity: About 7 (+- 2) bits of information can be held for about 20 seconds.
6.7 Describe the nature and capacity of the long-term memory	Without references, the students will describe the nature and capacity of the long-term memory. Their description will include that the long-term memory is a permanent storehouse of information that is thought to possess an essentially unlimited capacity.
6.8 State that the improvement of memory depends on improving encoding and retrieval	Without references, the students will state that the improvement of memory depends on improving encoding and retrieval. Their statement will include that chunks of information which are encoded in ways that make them more vivid and memorable are more easily retrieved than others.
6.9 Name the 2 control processes for the sensory register, and state their overall function	Without references, the students will name the 2 control processes for the sensory register as being: 1. recognition and 2. attention and state that their overall function is to determine whether information in the sensory register will receive further processing.
6.10 Explain the process of recognition	Without references, the students will explain the process of recognition. Their explanation will include that the process of recognition is interactive, in that it depends partly on information extracted from the stimulus itself, and partly on information stored in long-term memory. Hence, recognition involves noting key features and relating them to stored information. To the extent that a learner

	lacks relevant prior knowledge, or that an object's defining features are ambiguous, recognition and more meaningful processes will suffer.
6.11 Explain the process of attention	Without references, the students will explain that of all the stimuli acting on us at any given moment, only a fraction are recorded in the sensory register. Of these, only 1/3 may be selected for further processing. This selective focusing is what we call attention. Attention can operate at a number of points in the information processing system: prior to encoding in the sensory register, in the sensory register, or in short-term memory. Attention serves two purposes: 1. a general monitoring of the environment, allowing us to detect change, and 2. a selective focusing on stimuli which stand out due to their characteristics, or due to their personal significance at the moment.
6.12 List 5 factors which function as effective attention-getters	Without references, the students will list 5 factors which function as effective attention-getters. Their list will include: size, colour, intensity, novelty, and unexpectedness.
6.13 Name the control processes for short- and long-term memory	Without references, the students will name the control processes for short- and long-term memory. These will include: 1. maintenance rehearsal 2. elaborative rehearsal 3. retrieval
6.14 Explain maintenance rehearsal	Without references, the students will explain that maintenance rehearsal is the process by which information is repeated, so as to be held in short-term memory, just for a few seconds, for immediate use.
6.15 Explain elaborative rehearsal	Without references, the students will explain that elaborative rehearsal is the process by which information already stored in the long-term memory is used to facilitate the learning of new information. Two

	examples of elaborative rehearsal are organization and meaningfulness.
6.16 Explain the process of retrieval	Without references, the students will explain that retrieval is the process by which encoded information is located and extracted from long-term memory for use. Retrieval shares a reciprocal relationship with encoding; it is not always possible to make a distinction between encoding and retrieval strategies, since well-encoded chunks of information will be easier to retrieve than poorly encoded information.
6.17 Explain the process of organization	Without references, the students will explain that organization involves the processing of complex and interrelated information into chunks, so that there are fewer bits of information to remember. Each chunk serves as a cue for other items.
6.18 Explain what is meant by meaningfulness	Without references, the students will explain that learning is meaningful to the extent that the new learning task can be related to the existing cognitive structure of the learner. Information that is "meaningful" is more likely to be retained in the long-term memory, since it can be related to what is already known. This suggests that information to be learned must be connected with what one already knows, if it is to be remembered. Therefore, the basic rule of learning (remembering) is: associate what you want to learn with something you already know.

Strategies for Improving Learning And Recall

7.1 Define and provide examples of mnemonic devices	Without references, the students will define mnemonics as devices which impose meaning and structure on information where none naturally exist. They will provide at least 4 examples of mnemonic devices, and explain how each works. Their examples will include any 4 of: 1. rhyme mnemonic, 2. acronym or 1st letter, 3. acrostic or sentence, 4. peg or hook word, 5. keyword method, 6. method of loci, 7. stories or associations

7.2 Explain why mnemonic devices work	Without references, the students will explain why mnemonic devices work. Their explanation will include that: 1. they provide a context in which unrelated terms can be organized, 2. they make information meaningful by associating it with familiar, meaningful information, 3. they provide distinctive retrieval cues that must be encoded with the material to be learned, 4. they force the learner to be an active participant in the learning process by causing him to think about the nature of and meaning of the learning material.
7.3 Explain the benefits and drawbacks of teaching students to use mnemonic devices	Without references, the students will explain the benefits and drawbacks of teaching students to use mnemonic devices. The stated benefits will include that: 1. it points out to the students that the ability to learn & remember large amounts of information is an acquired capability, and 2. since they are interesting, fun and easy to learn, mnemonics serve an important motivating function, especially for low-achieving students. A drawback associated with mnemonics is that they might cause students to rely on them too much, serving as a crutch, without which the information cannot be retrieved.
7.4 Explain the use of ridiculous association in memorization	Without references, the students will explain the use of ridiculous association in memorization. Their explanation will include that in order to remember information, we must associate it with what we already know. To aid this process, we make the associations ridiculous, using incongruous or exaggerated connections.
7.5 Describe the role of verbal and physical activity in remembering	Without references, the students will describe the role of verbal and physical activity in remembering. Their description will include that activity aids the encoding of information in long-term memory, as evidenced by experiments in which students carrying out action acquired

	things at a faster rate, and in greater quantities than inactive students. This suggests that the use of verbal and physical activity in the classroom is important.
7.6 State that certain aspects of retrieval can be examined independently of encoding	Without references, the students will state that certain aspects of retrieval can be examined independently of encoding. These are the factors that cause us to forget, regardless of how well we have encoded the information.
7.7 Provide four explanations for forgetting, independent of encoding strategies	Without references, the students will provide 4 explanations for forgetting that are independent of encoding strategies. Their explanations will include: 1. disuse - fading away of the neurochemical brain trace due to infrequent use; similar to atrophy of a muscle that is not used. 2. reorganization or distortion - we tend to fill in gaps with related knowledge. Thus, prior knowledge distorts recall. 3. interference - new learning interferes with old and vice versa. This is known as "retroactive" or "proactive" inhibition. 4. repression - disagreeable and unpleasant experiences are repressed.
7.8 Suggest ways to minimize retrieval-related forgetting	Without references, the students will suggest ways to minimize retrieval-related forgetting. These will include: 1. using what is learned 2. stressing meaningfulness and distinctiveness 3. avoiding learning similar information at the same time, and employing distributed practice techniques 4. avoiding learning under unpleasant circumstances
7.9 Define metacognition	Without references, the students will define metacognition as being what we know about our own thought processes.
7.10 Explain the significance of metacognition to learning theorists	Without references, the students will explain that learning theorists

	are interested in how awareness of thought processes (or lack of it) affects learning. The hypothesis is that learning efficiency can be improved by encouraging learners to become more aware of various encoding strategies, and to use them more selectively and systematically.
7.11 List the steps in a basic learning strategy sequence, and state how it can be used with young children	Without references, the students will list the steps in a basic learning strategy sequence. These will include analyze, implement, monitor, modify. The students will state that these steps are beyond the capacity of most public school children, so they can be adapted for young children by the teacher analyzing the subject matter, deciding on effective learning strategies, telling and showing the students how to use them, monitoring their progress, and making necessary modifications.
7.12 Describe age trends in metacognition, and explain why they occur	Without references, the students will describe age trends in metacognition. Their description will address the fact that different types of learning strategies appear to be most effective with students of different age levels. They will note the inability of young children to diagnose task difficulty, monitor the progress of learning and use rehearsal techniques. They will attribute these inabilities to the fact that understanding and applying most learning strategies depends on the ability to form hypotheses, solve problems systematically, and engage in mental manipulations, all of which are characteristics of formal operational thinking which typically does not appear before age 12, if then.
7.13 Describe adjustments that may need to be made in using learning strategies with pupils of different ages	Without references, the students will describe the adjustments that may need to be made in using learning strategies with pupils of different ages. Their description will address the fact that most elementary school children have only limited knowledge of how their cognitive processes

work and when to use them. Therefore, it is necessary to provide them with specific instructions suitable for concrete thinkers, if learning strategies are to be used effectively. In addition, specific instructions should be given for every task, since students cannot be expected to generalize from one situation to another, unless the two learning tasks are almost identical.

Subskill Statement from Instructional Analysis	*Matching Performance Objective*
8.0 Identify practical classroom applications of Information Processing theories	Given a list of the key Information Processing theories covered, and using all that they have learned regarding the way in which Learning Theories yield practical classroom applications, the students will identify the practical classroom applications suggested by theories of Information Processing. The practical applications identified will include the following: - a limited amount of information is presented to students at any one time, in order to avoid over-loading of the short-term memory - presented information is well defined (i.e. unambiguous) to facilitate recognition - presented information is related to the learners' prior knowledge. Instruction progresses from the known to the unknown - a variety of techniques to attract and hold attention are employed (colour, size, intensity, novelty, unexpectedness) - presented information has personal significance - or is related to issues of personal significance - for the students - students are encouraged to relate new information with what they already know, so that meaningfulness is facilitated - information to be learned is organized, with older students being encouraged to organize material on their own - where material to be learned lacks inherent meaning or organized structure, students are shown how, and urged to, use mnemonic devices - where material to be learned is particularly difficult to remember, ridiculous association is encouraged - verbal and physical activity are promoted to aid students to remember information

- in order to minimize retrieval-related forgetting:
  *use of previously learned material is stimulated, and important concepts reviewed frequently
  *rote memorization is discouraged and meaningfulness is stressed
  *learning is made pleasant, fun, and non-threatening to the student
  *distributed practice techniques are encouraged and facilitated
  *conflicting subject matter is studied at different times
  *mastery of each step in a process is ensured, before progression to the next step is permitted, and thus interference is avoided

- older students are encouraged to be aware of how they learn, and to use learning strategies
- with younger children, the teacher analyzes the subject matter, decides on effective learning strategies, tells and shows students how to use them, monitors students' progress and makes necessary modification
- younger students are helped to diagnose task difficulty, monitor the progress of their learning, and use rehearsal techniques.
- younger students are provided with specific instructions for each learning task

LEARNING DOMAINS

1.1 Cognitive - knowledge
1.2 Cognitive - comprehension
1.3 Cognitive - comprehension
1.4 Cognitive - comprehension
1.5 Cognitive - comprehension
1.6 Cognitive - comprehension
1.7 Cognitive - comprehension
1.8 Cognitive - comprehension

2.1 Cognitive - comprehension
2.2 Cognitive - comprehension
2.3 Cognitive - comprehension
2.4 Cognitive - knowledge
2.5 Cognitive - comprehension
2.6 Cognitive - comprehension
2.7 Cognitive - comprehension

3.1 Cognitive - knowledge
3.2 Cognitive - comprehension
3.3 Cognitive - comprehension
3.4 Cognitive - comprehension
3.5 Cognitive - comprehension
3.6 Cognitive - comprehension
3.7 Cognitive - comprehension
3.8 Cognitive - comprehension

4.1 Cognitive - lower order rule using
4.2 Cognitive - lower order rule using

5.1 Cognitive - comprehension
5.2 Cognitive - comprehension
5.3 Cognitive - comprehension
5.4 Cognitive - comprehension
5.5 Cognitive - comprehension
5.6 Cognitive - comprehension
5.7 Cognitive - comprehension
5.8 Cognitive - comprehension
5.9 Cognitive - comprehension
5.10 Cognitive - knowledge
5.11 Cognitive - comprehension
5.12 Cognitive - comprehension
5.13 Cognitive - comprehension
5.14 Cognitive - knowledge
5.15 Cognitive - comprehension
5.16 Cognitive - comprehension
5.17 Cognitive - comprehension
5.18 Cognitive - comprehension
5.19 Affective - valuing
5.19a Cognitive - comprehension
5.20 Cognitive - concept recognition
Affective - valuing

6.1 Cognitive - knowledge
6.2 Cognitive - knowledge
6.3 Cognitive - knowledge
6.4 Cognitive - knowledge
6.5 Cognitive - comprehension
6.6 Cognitive - comprehension
6.7 Cognitive - comprehension
6.8 Cognitive - knowledge
6.9 Cognitive - knowledge
6.10 Cognitive - comprehension
6.11 Cognitive - comprehension
6.12 Cognitive - knowledge
6.13 Cognitive - knowledge
6.14 Cognitive - comprehension
6.15 Cognitive - comprehension
6.16 Cognitive - comprehension
6.17 Cognitive - comprehension
6.18 Cognitive - comprehension

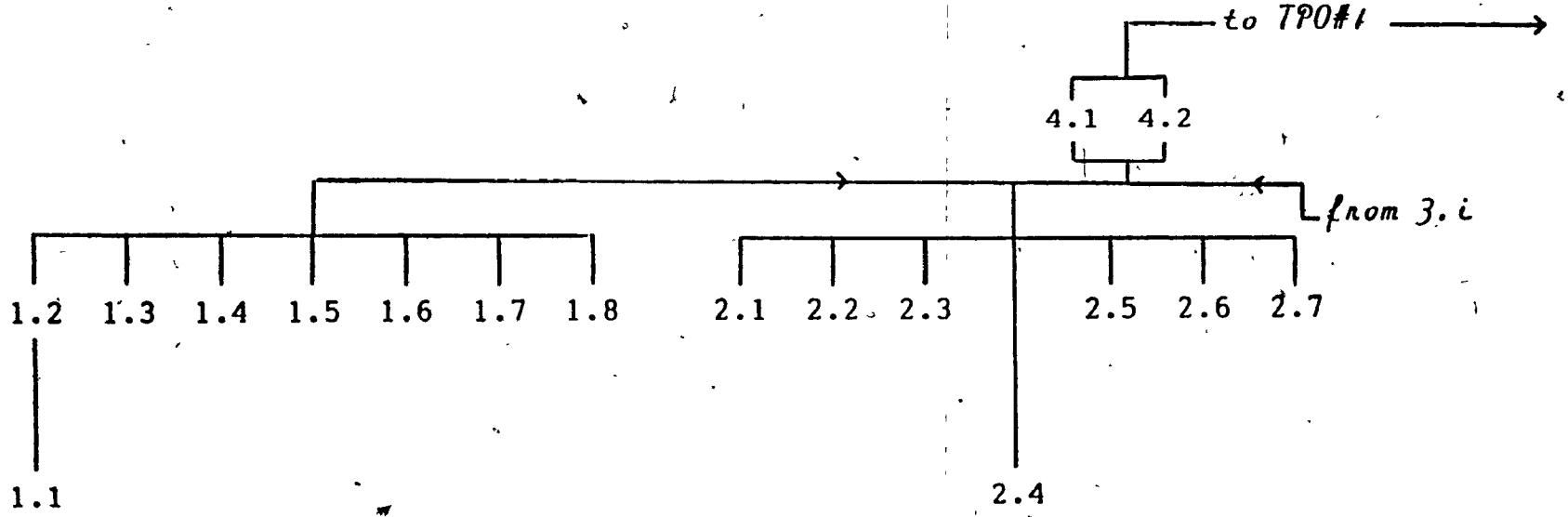
7.1 Cognitive - knowledge
7.2 Cognitive - comprehension
7.3 Cognitive - comprehension
7.4 Cognitive - comprehension
7.5 Cognitive - comprehension
7.6 Cognitive - knowledge
7.7 Cognitive - comprehension
7.8 Cognitive - comprehension
7.9 Cognitive - knowledge
7.10 Cognitive - comprehension
7.11 Cognitive - knowledge
7.12 Cognitive - comprehension
7.13 Cognitive - comprehension

8.0 Cognitive - lower order rule using

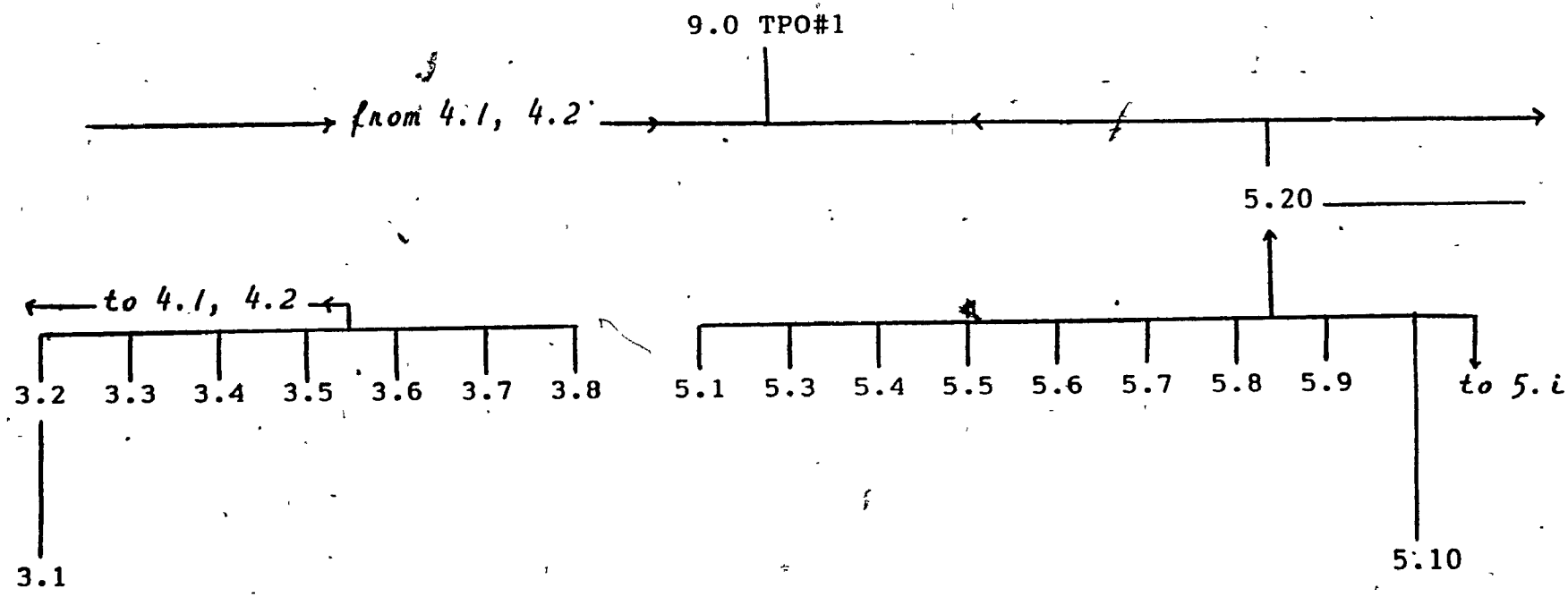
9.0 (TPO #1) Cognitive - application (higher order rule)
Affective - organization

11.1 Affective - valuing
Cognitive - concept definition
11.2 Affective - organization
Cognitive - concept recognition
11.3 (TPO #2) Affective - characterization
Cognitive - concept production

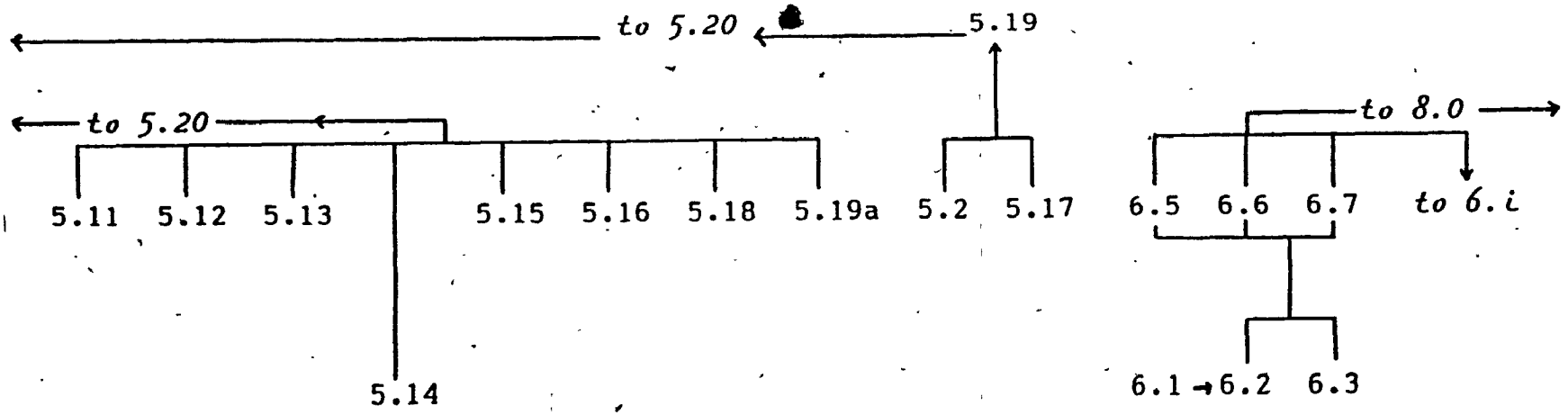
HIERARCHY OF OBJECTIVES - TPO#1



HIERARCHY OF OBJECTIVES - TPO#1 (cont.)



HIERARCHY OF OBJECTIVES - TPO#1 (cont.)



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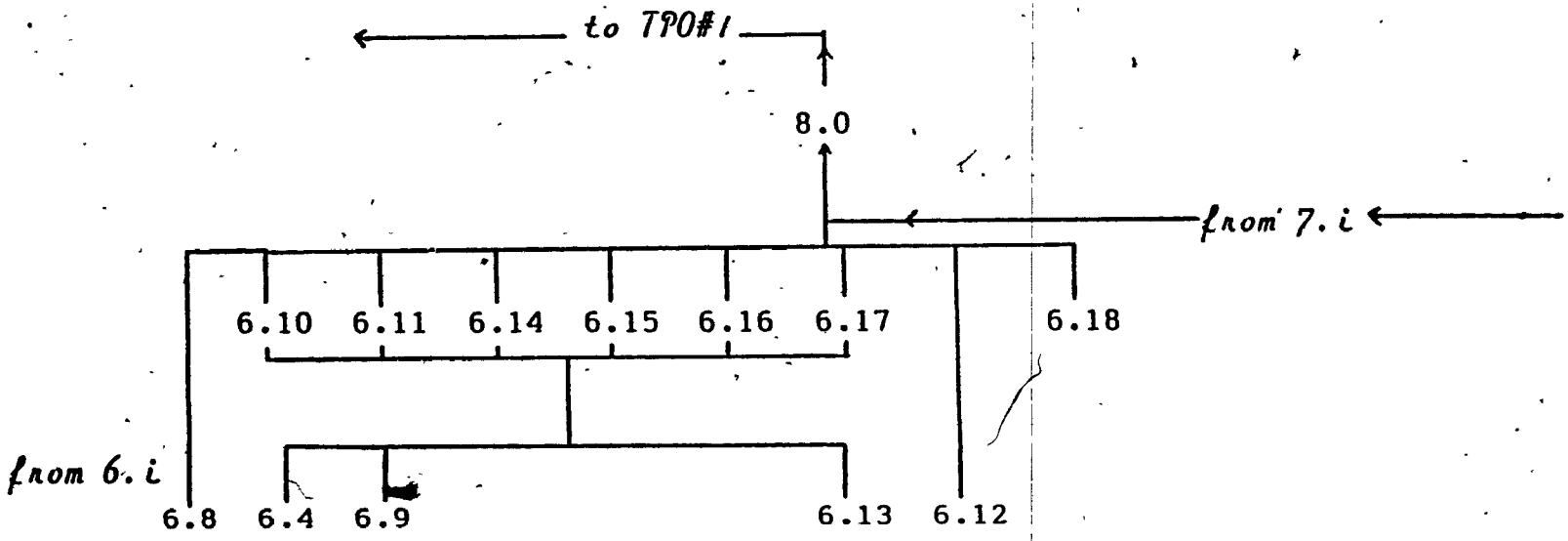
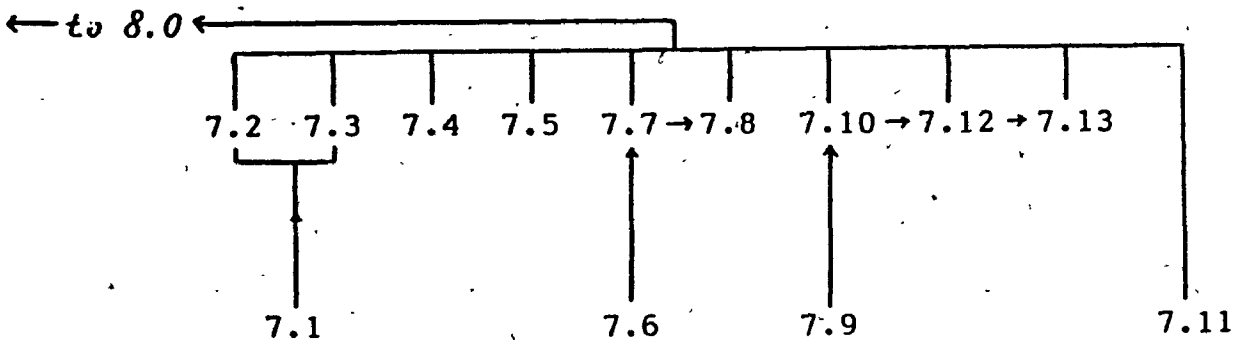
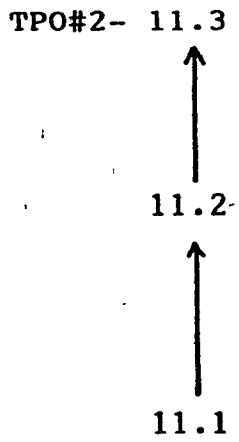


HIERARCHY OF OBJECTIVES - TPO#1 (cont)



HIERARCHY OF OBJECTIVES - TPO#2



Appendix C

The Instructional Unit

INSTRUCTIONAL UNIT FOR EDUCATIONAL PSYCHOLOGY C210 CONCORDIA UNIVERSITY

AN APPLICATION OF COOPERATIVE LEARNING, CLASSROOM PARTICIPATION, AND ADVANCE ORGANIZERS TO THE TEACHING OF LEARNING THEORIES

INSTRUCTOR'S GUIDE

INTRODUCTION

The Course Content

The course content covered by the present instructional unit consists of Cognitive and Humanistic learning theories, as well as theories of Information Processing. This content is to be taught by way of a combined cooperative learning/enhanced participation/advance organizer instructional strategy. The instructional unit stretches across the preliminary six weeks of the Winter semester, with the first five weeks being taken up by instruction, and the final week occupied by a mid-term quiz. Five lesson plans, complete with instructional materials and prescribed learning activities, have been provided to you in this instructor's guide.

General Goals of the Instructional Unit

By the end of this instructional unit, the students will:

1. demonstrate a thorough knowledge of the material covered in the three areas studied (i.e., Cognitive and Humanistic Learning Theories and Information Processing)
2. demonstrate a knowledge of how the above theories may be applied to classroom teaching
3. demonstrate the cooperative social skills necessary to collaborate with a group of students in facilitating the learning of material

Some Preliminary Considerations

Split Objectives

As evidenced by the general goals listed above, the instructional unit has been designed with two explicit objective types in mind: The first consists of academic skills, while the second involves collaborative skills. It is important for the students to be alerted to the importance of both of these objectives throughout the instructional process, so that they may consciously work towards attaining mastery of both.

Group Heterogeneity

The vast majority of the learning activities included in the unit involve small group work. In order to maximize the benefits of group work, it is expedient to construct heterogeneous ability groups (Webb, 1985). Assignment to groups should be carried out by the instructor, according to student ability, such that each group consists of one high, one low, and two medium ability students. If applicable, student characteristics such as sex and race should also be considered in the formation of heterogeneous groups.

Positive Interdependence

Positive interdependence is one of the most essential ingredients in cooperative learning. Accordingly, the instructional materials, goals, and tasks included in this unit have all been carefully designed so as to maximize the promotion of positive group interdependence. Instructors should make every effort to communicate to the students the importance of shared group concerns, and the necessity of working collaboratively.

5. Mastery learning - Ideally, one would want to ensure that each individual student attains mastery of all objectives in an instructional unit. This is usually achieved by way of embedded test items which require individuals to demonstrate mastery of each objective, before progressing on to higher level objectives. Given the emphasis on group processes in the present instructional unit, verifying individual mastery of objectives proves to be a problem: Although individual accountability is built into the unit (in the form of task sub-division and individual explanations throughout the unit, as well as an individualized posttest at the end of the unit), demonstration of mastery on all objectives occurs primarily on a group basis. In an attempt to alleviate this problem, two techniques are suggested:

a. Individual students should be encouraged to achieve individual mastery of all objectives: On completion of any group task, every group member should be required to sign their name to their group's Product Sheet (See Appendix) indicating that they have understood their group's answers and can explain

them. Students unable to explain all answers should be encouraged to request re-explanation from fellow group members or the instructor. Once all group members feel that they have mastered all the objectives covered (and have, therefore, signed their group's Product Sheet) the instructor may randomly select one person from each group to present their group's ideas to the rest of the class.

b. Corrective feedback, an essential feature of mastery learning, should be provided to all groups for all work accomplished.

Formative Evaluation

Five to ten minutes at the end of every lesson have been allocated for the evaluation of the lesson itself (including the materials and activities employed in teaching the content), and of group processes (how well the groups are functioning, and the extent to which the groups have been successful in achieving and maintaining effective working relationships). Examples of the lesson evaluation and group processes forms are provided in the Appendix.

THE FIRST CLASS SESSION

The first 30 minutes of the first class session will be spent carrying out the following activities:

1. returning and discussing the mid-term exam - Since some of the content covered by this exam is pre-requisite to objectives in the instructional unit that follows (namely, stimulus-response, reinforcement as motivation for learning), the instructor should ensure that this content is thoroughly understood by all students. Where required, clarification of the above content should occur, and any students who still do not understand it should be directed to pages 294 - 299 of their text book (Biehler & Snowman, 1985).

2. administering the pre-test - Before giving the pre-test, the instructor will explain to the students that the pre-test aims merely at guaging how much they know about the topics they are going to be studying over the next few weeks. She will tell the students that the pre-test is probably unlike any test they have ever written, since they are not expected to know the answers to the questions, having not yet learnt them. She will stress that no grades will be given for performance on the test. The instructor will, furthermore, discourage the students from guessing the answers to any of the questions, telling them to simply skip over any questions they are not absolutely sure of. Finally, the students will be told that if they cannot answer any of the questions in the first section, they need not go on to further sections of the test. The pre-test will then be administered. Since it is expected that the students will know few, if any, of the answers, 15-20 minutes will be provided for completion of the test. The test responses will then be collected from the students, and Lesson 1 of the unit will commence.
   Note: Owing to time considerations, the pre-test will be in abbreviated form, such that it tests the terminal objective and several key subordinate objectives, and not all of the myriad objectives contained inthe instructional unit.

LESSON 1

Topic: Introduction to cooperative learning and Cognitive Learning Theories

Objectives: 11.1, 11.2; 1.1-1.8; 2.1-2.7; 3.1-3.9
By the end of this lesson, the students will be able to name and identify the interpersonal and group skills necessary for successful group work; name and explain the main principles of Gestalt Psychology, Piaget and the Open Education movement, and Brunerian Discovery Learning.

Time: 2 and a half hours

Materials: Giant jigsaw puzzle, blackboard and chalk, roleplaying cards, transparency #1 and overhead projector, learning activity packages #1, 2 and 3, colour-coded co-op cards, Group Product sheets, Group Task sheets, Formative Evaluation sheets.

Introduce 11.1 & 11.2: The instructor requests the students to organize their desks in groups of four, and to push the grouped desks as close to the walls as possible, leaving an open space in the center of the classroom. Each student is then given one piece of a giant jigsaw puzzle. (There may be more pieces than students, in which case, some students will receive two pieces.) The students are requested to form the jigsaw puzzle on the floor in the middle of the classroom. The instructor gives them no further directions. It is expected that the preliminary activities of the students will be a little chaotic, until they are able to organize themselves such that they begin to listen to and help each other, working together to form the puzzle. The jigsaw puzzle, once formed, reveals a picture of some people on a boat, and the words, "We are all in this together; we sink or swim together."

Teach 11.1 & 11.2: The students are then requested to return to their seats. The instructor asks the students which behaviours they think led to their successes and failures in attempting to fulfil the task of putting together the jigsaw puzzle. It is expected that the students will attribute their successes to skills such as cooperating with each other, listening to each other, and helping one another. Their failures will be attributed to a failure to do the above. The instructor then explains to the students that over the next 5-6 weeks, they will be expected to work together in small groups. She then explains a little about cooperative learning, stressing the benefits that research has shown it to have (notably in achievement and social skills) and the "shared goal" structure which characterizes the approach. The instructor tells the students that obviously, such positive outcomes of cooperative learning can only occur if the groups are indeed "cooperative", with group members functioning effectively as they strive to achieve their desired goals. She asks the students what behaviours they would expect to see if they were observing an effective group at work. To prompt them, the instructor might suggest to the students that they think back to any group projects/assignments that they have been involved in, and to locate the specific factors which led to the group's success or failure. It is expected that the students will suggest group and interpersonal skills such as contributing equally to the end goal, cooperating, listening, sharing ideas freely, etc. As these are suggested by the students, the instructor writes them on the board. As they run out of suggestions, she prompts them by asking leading questions such as, "Would all group members feel equally comfortable with sharing their ideas?", "How would you handle disagreement among group members?", etc. The instructor may also suggest examples of effective group skills, if she suspects that they will otherwise be missed by the students. This continues until all of the following skills have been written on the board:

- contributing equally to end goal
- cooperating in planning and other aspects of task execution
- listening to each other
- sharing ideas openly and freely
- offering helpful and unoffensive criticism
- accepting others' ideas
- compromising
- providing support for others
- providing praise for good ideas
- helping others
- asking for help
- displaying positive feelings towards others
- displaying commitment to completing the task (avoid side-tracking)

The instructor suggests that the students write down this list of skills and keep it somewhere accessable, since these are the precise skills that the students will have to master in the weeks that follow.

At this point, the instructor assigns each student to the group he/she will be working with over the next five weeks. The instructor explains that while these are the "principle" groups, the students will have occasion to work with other class members in the weeks to come. Each group should contain four members. Where group members are absent, the remaining students are divided up among other groups to form groups of five. Group sizes smaller than four should be avoided.

Familiarize groups: The instructor then provides the students with a familiarization activity using colour-coded co-op cards. The activity involves the students in learning the names and three bits of information about their fellow group members.

Test 11.1 & 11.2: The instructor hands out a card to each group, on which is written one of the following role-playing situations:

The ineffective group: One person does all the work, there is no exchange of ideas, and nobody listens to each other

The effective group: Ideas are shared openly, quieter members are asked for their opinions; Where there is disagreement, compromise is reached.

The effective group: Members cooperate in dividing up work, help each other, and request help from each other.

The ineffective group: Criticism is offensive, others' ideas are not accepted, and there are no compromises made, so the task does not get completed.

The ineffective group: Go off track, do not listen to each other, and do not encourage each other to share their ideas.

The effective group: Praise offered for good ideas; when group wanders off topic, group members bring them back on topic; display positive feelings towards each other.

The ineffective group: Contribute equally to end goal, but no exchange of ideas, and no support offered to others.

The effective group: Listen carefully to each other, provide praise for good ideas, and provide support for each other.

The effective group: Unoffensive criticism offered, compromise is reached, and display positive feelings for each other.

The ineffective group: Members afraid to ask each other for help, afraid to share their ideas in case they are laughed at, and one person monopolizes the conversation.

The ineffective group: Display negative feelings towards each other, do not give help when asked for it.

The groups are given five minutes to prepare their respective role playing situations. The situations are then presented in front of the class. At the end of each one, the students are requested to record on paper whether the groups they have seen presented are effective or ineffective, and to provide the bases for their decisions. When all the situations have been presented, the students' responses are taken up by the instructor and discussed. Once this has been done, the students are requested to submit their response sheets to the instructor.

The instructor tells the students that, as is obvious from the role playing situations, it is extremely important for people to develop such interpersonal and group skills, if their work together is to be successful. She informs the students that while they will receive individual grades for their mid-term quiz, they will depend very heavily on their groups to provide them with knowledge of the material that will be tested on the quiz. She stresses the connection between the work on the group tasks over the forthcoming five weeks and the material covered in the quiz at the end of the five week period. The instructor should also alert the students to the fact that while some of the material to be covered may be found in their text book, a fair amount of it is not dealt with at all by the text. For this reason, she suggests that they attempt to attend classes as often as possible, especially since others will be depending on them (as well as the fact that it will be interesting and enjoyable too). The instructor then asks for and clarifies any questions the students may have about group work and group skills.

Introduce content: The instructor then presents a general overview of the course content that will be studied during the forthcoming weeks. (Note: The main points of the discussion that follows are noted on transparency #1. This should be shown to the students as the instruction progresses.)

Stimulate recall of pre-requisite knowledge (0.3): The instructor begins by asking the students if they remember how the behaviourists tended to explain learning. It is expected that the students will suggest notions such as stimulus-response and reinforcement. If they do not come up with it themselves, the instructor tells them that the behavioural theorists stressed observation of overt behaviour. Their argument was that the only scientific way to study learning is to base all conclusions on observations of how overt behaviour is influenced by forces in the external environment.

Introduce new concepts: The instructor asks the students if they think that all learning can be detected and explained in this way. The students will probably say no, and suggest examples such as problem-solving, language acquisition, undemonstrated learning and self-motivated learning as instances of learning for which the behaviourist approach provides inadequate explanation. The instructor then explains that dissatisfaction with the behaviourist approach caused American psychologists in the 50's, and European psychologists as early as 1910, to propose more cognitive views as to how we learn. These theorists are more willing to speculate about non-observable mental activities, i.e., to

infer what goes on in the minds of students as they learn. Instead of limiting themselves to observations of actual behaviour, Cognitive theorists speculate about how learners gain insight when solving problems. The instructor continues, telling the students that in the 60's and 70's, an approach that became popular was Humanistic education. The instructor asks the students what was going on in the world at this time. The students will probably say things like the hippy movement, the Viet Nam War, etc. The instructor tells the students that Humanistic education responded to the social and political crises of the times. Similar to the Cognitive approach, it stressed student discovery, but unlike the Cognitive approach, Humanistic education concentrated on the affective (or emotional) side of learning. In recent years, these approaches have become less popular, and a branch of Cognitive learning theory, known as "Information Processing", has become more popular. This approach investigates how humans encode, store, process and retrieve information. The popularity of this approach coincides with a renewed stress in education on improving the efficiency of students as learners, and on student mastery of material that is presented in an organized form by teachers.

The instructor tells the students that they will be covering these learning theories in the order that they were popular in North American education. Since they have already looked at the behaviourist theories last semester, they will begin this semester with the Cognitive learning theories. The instructor informs the students that, like all the approaches, the Cognitive approach is made up of various theories, all sharing the same basic assumptions, but differing slightly in their analysis of learning. She continues, saying that the students will be looking at three such theories under the heading of Cognitive learning theories, namely:

- Gestalt Psychology
- Piaget and Open Education
- Bruner and Discovery Learning

Teach 1.1-1.8, 2.1-2.7, 3.1-3.9: Note: The teaching of these objectives closely approximates the Jigsaw cooperative instructional strategy proposed by Aronson (1978). The instructor gives each group Task Sheet #1 for Cognitive Theories (See Materials Section). In addition, each group receives a Group Product Sheet on which to record their responses. The instructor explains that each group member must choose one of the three topic areas contained in the Cognitive approach. Since there are only three topic areas, and four group members, two peole from each group will share the responsibility for one of the topic areas. The students are told that once they have chosen their respective topics, they will go into an "Expert Group", made up of students from other groups who have chosen to cover the same topic. (Owing to the large number of students, there will be two Expert Groups for each topic area.) Once in their Expert Groups, the students are given a Learning Activities Package (see Materials Section), consisting of a series of materials and activities dealing with their particular topic. These they discuss and do with the members of their Expert Group. To guide them, the students are also provided with an Expert Group Guide Sheet which ensures that they cover all the key concepts included in their chosen topic area. When the students feel confident that they have learned all that they can about their chosen area, they return to their original groups, where they take turns teaching their fellow group members all they have learned.

Test 1.1-1.8, 2.1-2.7, 3.1-3.9: The groups are requested to answer the questions posed on the Group Task Sheet. If all the key concepts have been adequately covered, the group members should be able to answer all the questions. The instructor tells the students to ensure that every group member thoroughly understands all the key concepts, since any one of them may be asked to explain their group's responses.

The students are given one and three-quarter hours to complete the above exercise. While they work on it, the instructor moves from group to group, observing group processes, and clarifying any content questions that might arise. Ideally, the students would complete the above learning activities by the end of the lesson, at which point they would sign their Group Product Sheets, and submit them to the instructor. The instructor would then evaluate the work, and provide corrective feedback for the students, in time for the next lesson. Given the time taken up returning the mid-term exam and administering the pre-test, it is probable that the students will not have sufficient time to complete the above activities. If this occurs, time should be provided to complete the above learning activities at the beginning of the next lesson. On completion of the task, the Product Sheet should be signed, as before, and the students' responses taken up in class. In this case, aural, as opposed to written feedback should be provided to students, but the Product Sheets should, nevertheless be submitted to the instructor at lesson's end, so that mastery of the objectives can be verified.

Summary: The final minutes of the first lesson (and every lesson following) should be spent with the instructor summarizing the day's activities and informing the students that in the next class lesson they will learn how to derive classroom teaching practices from the theories they have been studying. Each student should then fill out a lesson evaluation sheet and either a group processes sheet, or a diary entry.

SUMMARY OF ACTIVITIES FOR LESSON 1

1. FORMATION OF GIANT JIGSAW

2. SHORT EXPLANATION OF COOPERATIVE LEARNING, GROUP WORK, AND FEATURES OF EFFECTIVE GROUPS

3. ASSIGNMENT TO GROUPS AND TEAM-BUILDING ACTIVITIES

4. ROLE PLAYING SITUATIONS AND DISCUSSION

5. OVERVIEW OF UNIT CONTENT, USING OVERHEAD PROJECTOR

6. JIGSAW LEARNING ACTIVITY, EMPLOYING SELF-INSTRUCTIONAL LEARNING PACKAGES

7. SUMMARY AND QUESTIONS

8. FORMATIVE EVALUATION

LESSON 2

Topic: Classroom applications of Cognitive learning theories

Objectives: 4.1, 4.2
By the end of this lesson, the students will:
match examples of specific classroom practices with the key Cognitive learning theories covered, and recognize applications of the baseline theories in a classroom situation.

Time: Two and a half hours

Materials: Film showing Cognitive theories applied to classroom teaching, video clip of "Ferris Bueler's Day Off", handout of key Cognitive theories, classroom scenario handouts, blackboard and chalk, Group Product sheets, Humanistic education task sheet #1, Formative Evaluation sheets

Complete 1.1-1.8, 2.1-2.7,3.1-3.9: The lesson begins with the students returning to their principle groups and completing the task they began on the previous week. As explained in Lesson 1, student responses must be taken up, andd discussed on completion of the task. It is likely that the various groups will complete the task at different rates. This gives the instructor the opportunity to go to each group individually, check what the members have accomplished, and provide corrective feedback. While the faster groups are waiting for the slower ones to complete the task, the instructor may choose one of the following two alternatives: She may either provide the groups with the materials for the next activity, explaining the task to them, and allowing them to begin, or she may simply ask them to begin discussing amongst themselves what use can be made of the theories they have so far looked at.

Introduce 4.1 and 4.2: Regardless of the alternative chosen, once all the groups have completed the first task, the instructor attracts the attention of all the class members and asks them why they think they are learning these theories. It is expected that the students will say that the theories help them to understand how people learn. This response is accepted by the instructor who then asks the students why it is particularly important for *them* to understand how people learn. The students will probably say that since many of them intend to become teachers, it is important that they understand learning. The instructor agrees with this, and adds that the learning theories do not only point out the ways in which people learn, they also suggest ways teachers should teach, so as to maximize student learning. In order to illustrate this point, the instructor asks a student to name any one of the theories advocated by the Cognitive theorists. For the theory suggested, the instructor provides the general classroom teaching application that the theory implies. (e.g., if the Gestalt principle that "perceptions are influenced by the way stimuli are arranged," is suggested, the general classroom applications would be that related concepts should be grouped close together in time and space, and techniques such as highlighting, contrasting and framing should be used to make key information stand out as figure against background.)

Teach 4.1: The instructor then informs the students that they are going to be studying the classroom applications of Cognitive learning theories. They will begin by looking at specific examples of how cognitive theories are applied in the classroom, and then try to come up with some general "guidelines" that the Cognitive theories provide us with.

concerning classroom teaching and learning. The exerpt from "Ferris Bueler's Day Off" is then shown to the students. Next, fifteen minutes of a film showing applications of Cognitive theories are shown to the students. The students are forewarned to look out for the applied theories. After the film, the instructor asks the students to name some of the theories on which the specific classroom practices shown in the film were based. The students will probably be able to link some of the practices shown with some of the baseline theories. The instructor may prompt them a little, but it is not necessary to cover all of the practices depicted, since this will be done in the testing activities that follow. Hence, a short discussion linking some of what they've seen with some of the theories studied will suffice at this point.

Test 4.1: Each group of students is then given a list of the key Cognitive theories covered thusfar, and a classroom scenario depicting Cognitive theories in application. The students are informed that they must match each classroom application to a Cognitive theory on their list. They are allerted to the fact that any one theory may be linked with more than application, and vice versa. They are asked to indicate the linkages by simply noting, next to each application on the scenario sheet, the number of the particular theory theory from which it was drawn. This task should take the students approximately 30-40 minutes to complete. While they work on the task, the instructor circulates, observing group processes, and providing assistance where needed. When the students have completed the task, the instructor selects a student from each group to read out each part of the scenario and to name the theories linked to the various applications included therein. Agreements and disagreements are discussed among the whole class, with the instructor clarifying any misconceptions.

Teach 4.2: Two additional scenarios, with the appropriate theory numbers already marked on them, are then given to each student. The students are informed that by looking at various examples of specific applications of the theories, we can derive general guidelines for classroom teaching. The students are asked to find, on each of their scenarios, the applications of Cognitive theory #3 (i.e., perceptions are influenced by past experiences and current interests.) The instructor then asks the students what general applications may be derived from theory #3. It is expected that, given the three specific applications of the theory, the students will be able to deduce the general application of the theory (namely, instruction should tap the interests of the learners and should build on what is known by them, that is, instruction should progress from the known to the unknown.)

The instructor informs the students that they are going to use their various scenarios to derive general applications for all the key cognitive theories. She tells them, however, that before they begin, there is something very important they must consider.
Stimulate recall of prerequisite knowledge 0.1 &0.2: She then goes on to ask them whether they think that all the theories can be applied in the same way and in the same degree in every teaching situation. The students will probably say no, since every teaching situation is different. The instructor then asks the students what factors make each situation different. The students will probably know that the learner characteristics and the nature/objectives of the task may differ from situation to situation. The instructor accepts these answers and writes "learner characteristics" and "task objectives" on the board. She asks what kinds of factors come under the heading of "learner characteristics". The students will probably offer suggestions such as age level, stage of cognitive development, interests and entry level knowledge (all of which were studied last semester). These are written by the instructor on the board, under "learner characteristics". The instructor then asks what factors come under the heading of "task objectives". Suggestions should include subject matter and desired learning outcomes. These are written on the board under "task objectives". The instructor stresses to the students the importance of keeping these factors in mind when deriving the general applications of the theories. While some practices may

be appropriate in any instructional situation, others may only be appropriate under certain circumstances, involving certain learners and objectives. She asks them if they can think of an example of this. The students will probably suggest that discovery learning can only be used in attaining some objectives, and is less appropriate for others. Similarly, the age of the learners and their stage of cognitive development will effect the appropriateness of an expository versus a discovery approach. The instructor tells the students that their general applications of the theories should encompass and take into account such restrictions and conditions. In this way, if they ever want to apply a specific theory to a specific situation, they will know whether such an application is appropriate or not.

Test 4.2: At this point, the instructor may want to take another theory and illustrate to the students, for a second time, how to derive its general application. The students are then asked to begin the task of deriving general applications or "guidelines" of each of the key theories applied in the scenarios. They are told that they may consult with other groups if they wish. Their responses are to be reported on a Group Product sheet, signed, and submitted at the end of the lesson. Once again, the instructor circulates, observing group processes and offering assistance, while the students work on the task. The Group Product sheets should be corrected by the instructor, and returned to the students at the next class.

Summary: Time is provided at lesson's end for summarizing what has been achieved in the lesson, for pulling together the main points of the Cognitive approach, and for clarifying any questions that the students may have. The instructor also informs the students that they will be going on to Humanistic Education next week. She gives them the Humanistic Task Sheet #1, and tells them to use their text book to prepare it (individually or with others) for the next lesson. She informs them that the task sheet is to be submitted to the teacher in the next class.

As before, the final 5-10 minutes of the lesson are spent evaluating the lesson and group processes.

SUMMARY OF ACTIVITIES FOR LESSON 2

1. COMPLETE LAST WEEK'S TASK

2. QUESTION/DISCUSSION: WHY DO WE STUDY LEARNING THEORIES?

3. FILM: COGNITIVE THEORIES APPLIED IN THE CLASSROOM, FOLLOWED BY DISCUSSION RE. WHICH THEORIES WERE REPRESENTED.

4. SCENARIO OF COGNITIVE THEORIES APPLIED IN THE CLASSROOM. STUDENTS MATCH EACH APPLICATION TO A THEORY.

5. STUDENTS GIVEN OTHER SCENARIOS, SHOWN HOW, AND THEN ASKED TO DERIVE GENERAL APPLICATIONS FOR THE THEORIES.

6. SUMMARY AND QUESTIONS

7. ASSIGNMENT OF HUMANISTIC EDUCATION TASK SHEET

8. FORMATIVE EVALUATION

LESSON 3

Topic: Humanistic Education

Objectives: 5.1 - 5.20
By the end of this lesson, the students will be able to describe the general thrust of humanistic education, the factors leading to its popularity and decline, and the main principles contained in the approach. In addition, the students will evaluate the appropriateness of humanistic techniques in current educational practices, and explain how these techniques may be modified to better suit current practices.
Note: The lesson that follows aims to simulate, as closely as possible the features of a humanistic classroom, while at the same time teach the principles of humanistic education.

Time: Two and a half hours

Materials: posters with humanistic sayings, center headings,books, readings, filmstrips, phonodisc and cassette specified in Materials section; filmstrip reader, record player, tape recorder; video of "Summerhill", VCR and TV monitor; handout of animal story; magazines, scissors, bristleboard, glue, crayons/markers; Group Product Sheets; Formative Evaluation Sheets.

Arrangement of the learning environment:
On entering the classroom, the students should recognize immediately that something is different. Around the room, the instructor will have put up a number of posters, on which are written the following humanistic statements:

> If a man does not keep pace with his companions, perhaps it is because he hears a different drummer. Let him step to the music which he hears, however measured or far away.
> - Henry David Thoreau

> Man ultimately decides for himself. And in the end, education must be toward the ability to decide. - Viktor Frankl

> You cannot teach a man anything. You can only help him to discover it within himself. - Galileo

> I can is more important than I.Q. - anonymous

> The secret of education lies in respecting the pupil.
> - Ralph Waldo Emerson

> A person learns significantly only those things which he perceives as being involved in the maintenance of, or enhancement of, the structure of Self. - Carl Rogers, Perceiving, Behaving, Becoming

> The most deadly of all sins is the mutilation of a child's spirit.
> - Erik Erikson, Young Man Luther

Also set up around the room are 5 learning centers. Each deals with one or two of the various aspects of humanistic education, including:

1. Assumptions about pupils and the basic nature of education
2. Characteristics of effective teachers; desirable teacher-pupil relationships
3. Confluent education; the exploration of feelings and emotions.
4. Self concept and school achievement
5. Exploration of values and attitudes; grading policies

The video, "Summerhill" has also been set up to run in one corner of the room. The video depicts the famous humanistic school, Summerhill, and includes testimonies of some of its students, and interviews with its creator. Since the video has been set up within the classroom, it will be necessary to set the volume at a low level, so that it is audible to those near it, but does not distract class members involved in other activities.

Teach 5.18: The lesson begins with the instructor requesting that the students take out a pen and a piece of paper. She asks them to write down all the things they would not have experienced had they skipped out the last two years of their lives. The students are then requested to share at least one of the items that they have listed with the members of their group. The purpose of this activity is two-fold: On the one hand, it demonstrates that principle of humanistic education which calls for teachers to encourage students to explore their feelings and emotions. Secondly, it facilitates self-disclosure among group members, and should, therefore, serve to strengthen group ties.

After they have completed the above activity, the students are told that activities such as this, which encourage students to explore their feelings and emotions, are advocated by the humanistic approach to education. The instructor informs the students that a number of centers, dealing with this and various other aspects of humanistic education, have been set up around the room, and that they are to be given half an hour to visit these centers. She explains that the centers are, for the most part, browsing centers, although some contain activities. The students are told that the only "rules" which they should take into account as they visit the centers are that 1. they must move from center to center *with* their groups, and 2. they should avoid having more than two groups at any one center at any one time. In order to ensure that all the groups visit all the centers within the allotted time, the instructor regulates the amount of time spent at each center by telling the students when to move on to the next center. As the students visit the centers, the instructor circulates, providing aid and clarification where needed.

Explain concept of humanistic education and place it in context with other learning theories: After half an hour, the students are requested to return to their desks. The instructor then reads the "story" of the animal school to the students (See Materials section). Note: The instructor may want to provide each student with a handout of the story. Once she has read the story, the instructor explains that it was precisely in reaction to this type of rigid, dehumanizing school system, that the movement of humanistic education came about. She explains that, just like the other approaches studied so far, the humanistic approach to education is an off-shoot of its counterpart movement in psychology, but that other than this, the humanistic perspective on learning is quite different from those of the behaviourists and Cognitivists. Not only is the perspective different, but its place as a movement in learning theories is different since, unlike the other approaches, the humanists do not claim to adhere to any one model of learning, nor do they want one. As a result of this, humanism is often omitted from analyses of learning theories. The instructor should stress that despite this fact, the humanist movement has contributed some valuable and

novel insights to the field of learning, and was the dominant trend in North American educational practices for over a decade. For these reasons, humanism is covered in this section of C210.

Place humanism in historical context: Having placed the humanistic approach in the context of learning theories, the instructor goes on to examine it in an historical context. She informs the students that Humanistic psychology was founded in 1962 by a group of psychologists led by Abraham Maslow. She reminds the students of what was going on in the world during this period of time, namely, a widespread dissatisfaction with society and education, expressed in campus riots, ghetto demonstrations and civil rights movements, and a general distrust of, and abhorence for authority. The instructor explains that in response to a hostile, dehumanizing world in which loneliness, authority and lack of meaning were the order of the day, humanistic psychology (also known as Third Force psychology) was an attempt to re-focus on the experiencing human being, and to stress such distinctively human qualities as choice, creativity, valuation and self-actualization. Perhaps of central concern to the humanists is valuing the dignity and worth of humankind, and helping the individual to develop the potential inherent in every person. Emphasis is placed on the person as he/she discovers him/herself, and relates to others.

The instructor continues, telling the students that this general philosophy is mirrored in the humanistic approach to learning. The Greek poet Pindar expressed this when he said, "We must learn to become who we are." Immediately, the enormous difference between the learning approaches of the behaviourists and cognitivists and that of the humanists becomes blatantly clear. For the humanist, what is to be learned is not the way out of a maze, nor complex cognitive structures, but how to "become", or, in the words of Abraham Maslow, how to "self-actualize". Learning is viewed, not as a momentary, problem-solving activity, but as a life-long process.

The instructor points out that the humanistic approach to formal education agrees with the basic principle of the cognitive approaches which suggest that the teacher should arrange the learning environment to permit students to make their own discoveries. For this reason, the physical set up of a humanistic classroom will quite closely resemble a cognitive one. However, humanistic education stresses, in addition, an emphasis on emotions and feelings.

Take up 5.1 - 5.17: By the time the present lesson takes place, the students will already have been taught objectives 5.1 - 5.17 by their text books, and will have been tested on these objectives by way of the Humanistic Task Sheet #1, distributed at the end of the last lesson. (Note: The task sheet and assigned reading serve not only to teach and test objectives 5.1 - 5.17, but also as an advance organizer for the lesson on humanism.) At this point in the lesson, the instructor asks the students if they experienced any problems with, or have any problems regarding, the reading and task sheet they were given to complete at home. Any questions raised by the students are then answered and clarified by the instructor.

Test 5.18: The instructor explains to the students that the reading that they did at home informed them of the various arguments proposed by the so-called "elder statesmen" of humanistic psychology, and those of other humanistic psychologists, as well as of the various humanistic techniques developed by educators. She informs them that all of these theories can be brought together and combined, to reveal nine basic concerns or features of humanistic education. She tells the students that at least 8 of these 9 features were embodied by the centers that they visited earlier in the lesson, and the activity that they did at the beginning of the lesson. (The ninth (students encouraged to identify and empathize with others' feelings) was also demonstrated, but was implicit in the activities, as opposed

to the others which were explicit, and therefore may be harder to identify.) She tells them to use what they have read and learned at home, and the lesson activities to identify as many of the nine characteristics of humanistic education as possible in the following format: Using the magazines, scissors, glue, markers, and bristleboard provided, the students must create a picture which illustrates as many of the nine characteristics as they can remember. They must do this task without referring to their texts. The center titles should also be concealed while the students work on their pictures. The group members are requested to sign their work, signifying that they have understood the principles presented thereon.

When the groups have completed the task, the instructor calls on a member from each group to explain their picture. (Here, the instructor may ask each group representative to explain either their group's entire picture, or just one of the humanistic principles depicted, such that each representative explains a different principle.) It is possible that some of the nine humanistic principles will be omitted or poorly explained by the students. Thus, where they are not sufficiently brought out by the students themselves, the instructor should stress the following points:

1. Assumptions about pupils and the basic nature of education
   - students are provided with choice so that the resultant learning is meaningful. Cardinal principle of humanistic education: Give children choice.
   - positive attitude towards learning is encouraged
   - education is learner-centered; student retains control of his/her learning
   - emphasis on learning to learn, not on what is learned
   - learning environment is open, caring and non-threatening; discovery facilitated

2. Characteristics of effective teachers
   - teacher trusts children's choices re. what they need/want to learn
   - teacher functions as a learning facilitator, providing learning resources, and guiding as opposed to dictating
   - teacher should be sincere, confident, versatile, should prize students and empathize with them, and communicate the belief that all the students in the class can learn

3. Affective factors should be stressed as much as the cognitive side of subject matter
   - this known as "Confluent Education"

4. Relationships between teachers and pupils have an important impact on learning
   - positive teacher-student relationships established
   - problem ownership established
   - I messages used; speak to situation, not to personality

5. How children feel about themselves influences the way they learn
   - teacher strives to help students develop positive feelings about themselves

6. Teachers should encourage students to explore their feelings and emotions
   - in the text, sensitivity training and encounter groups are suggested as techniques to achieve this. But, as we have seen in the opening exercise of this lesson and the centers, there are many other ways of achieving this. Another example is "object lessons".

7. Students encouraged to identify with and empathize with others' feelings
   - suggested techniques: role playing, psycho-drama, socio-drama, simulation games (The instructor should explain to the students that by being exposed to a simulated humanistic classroom today, the students should come to understand what it would feel like for a child in an actual humanistic classroom.)

8. Teachers should use techniques to make students aware of, and act upon, their values and attitudes
   - this is precisely what they were requested to do at center #5. A more common technique for encouraging values awareness and action is a strategy known as "Values Clarification". The instructor informs the students that they will be taking part in such a strategy in a short while.

9. Non-traditional grading practices
   - traditional grading disfavoured since it causes students to feel inferior and to compete with each other; places teachers in the role of authorities and judges, rather than learning facilitators
   - pass/fail or credit/no credit evaluation procedures preferred

Teach 5.19: The instructor explains that the humanistic approach is somewhat less popular today than it was 10 years ago. She asks the students if they remember from their reading, or if they can infer on their own, what led to the decline in popularity of the humanistic approach. The students will probably know that the liberal social and political climates that had favoured humanism changed and became more conservative, and that poor grades, attributed to discovery and learner-centered approaches, led to a renewed stress on basic, "3R" education. If the students do not suggest these reasons on their own, the instructor should prompt them by asking leading questions such as, "What single factor could turn educators against any approach?" (Answer: Poor achievement by students), and "Where does the emphasis lie in current educational practices, as opposed to when you were in junior school?" (Answer: Stress on basics).

The instructor then informs the students that of the nine features of humanistic education, Biehler and Snowman consider only three to be worthy of consideration in education today. These include:
1. stressing affective as well as cognitive learning
2. teacher sensitivity to student feelings and needs and
3. inviting students to think about their values and attitudes.

The students are asked to consider the nine features of humanistic education, and to decide which ones they personally think are worthwhile practices in education today. She asks students who think that 0 - 3 (other than the 3 accepted by Biehler and Snowman) are relevant to go to one corner of the classroom. Those who agree with Biehler and Snowman's choices should go to another corner of the room, while those who favour 4 - 6 of the practices should go to another corner. Finally, those who approve of using more than 6 of the practices in schools today should go to the final vacant corner of the room. The students in each corner are provided with 10 - 12 minutes to discuss, and prepare a defense for, their acceptance and/or rejection of the nine features. A representative from each group is then selected by the instructor to present to the rest of the class their group's argument. In this way, a short class discussion regarding the appropriateness of humanistic practices in education today is facilitated. It is likely that there will be considerable dissention, even among members of the same groups.

Teach 5.20 and 5.20a: After a few minutes of discussion, the instructor should stress to the students that there is no absolutely right or wrong answer to the question being considered. She points out, however, that what cannot be disputed is that the practices proposed by the humanists evolved from a genuine concern with, and sincere caring for, how students feel, and what the school system contributes to, or detracts from, the human spirit. She tells them that inevitably, their use or non-use will depend largely on the school system that hires them and can also, therefore, fire them. Yet, in the final analysis, each person's approach to teaching will be determined by themselves, and their own personal convictions. She explains that for any of them who believe in the importance of treating their students as human beings, and enhancing the development of their human qualities, there is a way to adapt and integrate the nine practices of humanistic education, so that they become more compatible with current educational practices, while still remaining essentially humanistic. The instructor then goes through each of the nine humanistic practices, asking the students how they think each could be adapted. In the teacher-student exchange that ensues, the instructor should be sure to stress the following ideas:

- Given the current educational climate, it is not feasible to allow students to make all the decisions about their learning. Certain content (notably 3Rs) must be covered. Students may manage their learning some of the time. Contracts are a good structuring device which still allow some student choice.
- Teacher can only function as a guide some of the time. Sometimes necessary to tell students the answers they seek or facts.
- It may be unwise to stress affective side of learning in the 80's to the extent advocated by Combs, but should still be explored to get students personally involved.
- A positive teacher-student relationship should be established, but the teacher should maintain some distance and not function as a friend, since this is too complicated and risky
- The teacher should indeed strive to help students develop positive feelings about themselves.
- Techniques of sensitivity training and encounter groups as tools to encourage students to explore their feelings and emotions are held in disdain today, but other techniques may be judiciously used.
- Encouraging students to be aware of their feelings and those of others,independently of presenting subject matter, is considered problematic by many. Widely accepted, however, when aimed at increasing involvement and interest in subject matter.
- Unlikely that values clarification will change students' habits and lives. However, they may provide students with valuable insights, and may therefore be used judiciously. Other techniques to encourage the development of desired attitudes, such as object lessons and setting an example, may also be used.
- With the emphasis on mastery in today's schools, teachers are expected to assign and defend traditional grades that reflect mastery of specific instructional objectives. However, for some activities, it is expedient and acceptable not to give grades, e.g., journals, creative writing, visual arts (in junior grades).

Test 5.19, 5.20a and 5.20: The instructor provides each group of students with a printed scenario of a humanistic classroom, in which some humanistic techniques have been adapted to "suit" current educational practices. The scenario is, in fact, the same scenario as the students worked with when they were studying cognitive learning theories,

but it has been supplemented with adapted and unadapted humanistic techniques. Each group also receives a Group Product Sheet. The students are requested to pick out, and note down on their group product sheets, any humanistic techniques contained in the scenario, and explain how the adapted ones have been modified. When they have completed the task and signed their sheets, the instructor picks a representative from each group to share with the class two or three of the adapted and unadapted techniques that they have located in the scenario, and to explain how the adapted ones have been modified. The instructor provides corrective feedback for any incorrect or omitted identifications.

Summary: As always, the instructor provides closure to the lesson by summarizing what the students have covered in the lesson, and asking if they have any questions or concerns regarding humanism. She informs the students that next week they will be going on to Information Processing.

In the final minutes of the lesson, the students fill out a lesson evaluation sheet and either a group processes sheet or a diary entry. While they do this, the instructor collects their responses to Humanistic Task Sheet #1 (i.e., the homework assignment) and the group product sheets completed in the last activity. These she corrects and returns to the students at the next lesson.

SUMMARY OF ACTIVITIES FOR LESSON 3

1. FEELING EXPLORATION ACTIVITY - **5 MINS.**

2. LEARNING CENTERS - **30 MINS.**

3. STORY OF ANIMAL SCHOOL; TEACHER EXPLANATION OF CONTEXT AND CONCERNS OF HUMANISTIC EDUCATION - **15 MINS.**

4. TAKE UP TASK SHEET #1 AND READING OF CHAPTER 9 DONE AT HOME - **15 MINS.**

5. STUDENTS CONSTRUCT PICTURE OF 9 FEATURES OF HUMANISTIC EDUCATION - **35 MINS.**

6. DISCUSSION RE. DECLINE IN POPULARITY OF HUMANISTIC EDUCATION; VALUES CLARIFICATION ACTIVITY RE. CURRENT RELEVANCE OF HUMANISTIC PRACTICES - **25 MINS.**

7. SCENARIO OF MODIFIED HUMANISTIC EDUCATION PRACTICES - **20 MINS.**

LESSON 4

Topic: Information Processing

Objectives: 6.1-6.18; 7.1-7.13
By the end of this lesson, the students will be able to define information processing, as well as name and explain the structures and control processes which function in the brain's processing of information (according to the Atkinson-Shiffrin model of Information Processing). In addition, the students will be able to name and explain 5 ways of improving memory, including mnemonic devices, ridiculous association, verbal and physical activity, minimizing retrieval-related forgetting, and metacognition.

Time: Two and a half hours

Materials: 2 charts depicting number strings (to be used for Memory Activity #1), word-list transparency (to be used for Memory Activity #2), overhead projector, advance organizer (3 pages on transparencies, and 3-page student handout), Group Activity Package A (10 packages) and Group Activity Package B (4 packages), Group Task Sheets (re. Strategies for Improving Learning and Recall), Group Product Sheets, Lesson Evaluation and Group Processes Forms.

Introduce topic:

Introductory lecture: Begin by reminding the students that today they will be looking at a topic whose primary concerns are quite different from those of Humanism, namely, Information Processing. Next, tell them the following:
Information Processing is a branch of Cognitive Learning Theories. Like the Cognitive approach, it stresses the unobservable mental processes that go on in the brain during learning. You will notice, however, that the approach taken and the terms used by psychologists interested in Information Processing are distinctly different from the theorizing of Gestalt psychologists, Piaget and Bruner. Research on Information Processing places stress on the working and capacity of memory. It is easy to see why memory is such a fascinating area of study, since it works in such interesting ways. Psychologists who carry out research in Information Processing have tried to isolate just how the mind works when people try to memorize information. Let us take a look at the kinds of experiments that they have done.

Memory activity #1: At this point, ask the students to take out a piece of paper and a pen. Inform them that you are going to show the class a string of numbers which they must try to remember. Tell them that they will have 10 seconds in which to look at and memorize the numbers. Next, ask half the class to look away, while you show the other half the following number string for 10 seconds:

7142128354249 56

After 10 seconds, remove the number string from view and ask the students to write down as many of the numbers as they can remember. Inform the remaining half of the class that they may now look, and show them the following number string for 10 seconds:

7 14 21 28 35 42 49 56

Ask them to write down as many of the numbers as they can remember. Next, show both number strings to both halves of the class, and ask how many people in each group were able to remember all of the numbers in the string. It is expected that more people in the second group will have recalled all 15 digits in the number string correctly (especially if they have recognized that the numbers in the string are all multiples of 7). Ask the students why this is so, and what it tells us about the working of our memories. The students will probably say that we are not able to remember a great deal of information given to us at one time, but that we are able to remember more when we recognize some sort of familiar pattern in the material that we are trying to remember.

Memory activity #2: Next, tell the students that we can discover other clues about the way memory works, if we look at what happens when people are asked to remember lists of words. Use transparency #2 and the overhead projector to show the students the following list of words. You should go down the list of words, showing just one word at a time, for 3 seconds each:

dog
window
hose
pie
cards
tree
cup
car
table
knee

Remove the word list, and allow the students time to write down as many of the words as they can. When they have done this, show them the complete word list, so that they can check how many of the words they have managed to recall. Ask the students if any of them were able to remember all of the words. Probably few, if any, will have managed this. Ask if anyone got 5 right, 6... 7... 8... etc. and ask various students what techniques they used in order to remember the words. This line of questioning will reveal that those students who used no memory techniques will have remembered the fewest number of words, whereas those who tried to associate or organize the words in some way (especially by way of some sort of visualization technique) will have remembered the greatest number. You should alert the students to this fact.

Place Information Processing in historical context: Tell the students that the patterns exhibited in the above activities are precisely what Information Processing theorists study. These theorists ask the question, "How does the brain function in order to learn or remember information." Next, explain the following to the students:
Starting in the mid-1970s evidence began to accumulate, showing that students exposed to open, discovery and humanistic approaches to learning were less well educated than previous generations of students. Even before this, many Cognitive psychologists who, in the years surrounding World War II, had become interested in human engineering and communications research, and who had reasoned that there were definite advantages to speculating about what goes on in the learner's mind when confronted with a problem, had felt dissatisfied with the rather vague descriptions of cognitive processes proposed by Piaget and Bruner. They therefore began to search for ways to study thought processes with more precision.
At about the time a new way of thinking was being sought, computers began to appear on the scene. The excitement surrounding the computer explosion led psychologists to consider whether there were similarities between computers and the human mind. As a

result, researchers began to study how humans transform "input" to "output", and how they encode, store, process and retrieve information. An enormous amount of research in this area was stimulated, and numerous theories emerged. Eventually, several theorists developed flow charts (similar to those used in working with computers) to describe how the human mind works. Some researchers, such as Atkinson and Shiffrin developed models of Information Processing which concentrated on stages of processing. Others (notably Craik and Lockhart) maintained that a better approach was to think in terms of levels of processing rather than stages.

Provide advance organizer: Tell the students that they will be looking at a model of Information Processing based on the Atkinson-Shiffrin approach. Next show them the advance organizer provided (See Materials section). Give each student a copy of the 3 pages that make up the advance organizer. You may also use the transparencies provided to display the advance organizer. Briefly explain the model of information processing depicted by the advance organizer (page 1), the features contained in the model (page 2), and the strategies for improving learning and recall that it suggests (page 3). Make sure that the students understand that they will be studying these concepts in the course of today's lesson.

Teach & Test 6.1-6.18: Tell the students that they will start by first looking, in greater detail, at the structures and processes of the brain that are involved in the processing of information. Ask the students to get into their principle (i.e., "home") groups. Ensure that there are 10 groups formed. If there are less than 10 groups, split the larger groups into two. If, on the other hand, there are more than 10 groups formed, you should combine the smaller groups. Next, either assign, or allow the students to choose one of the following topics:

1. The Information Processing System/Model
2. The Sensory Register
3. The Short-Term Memory
4. The Long-Term Memory
5. Recognition
6. Attention
7. Maintenance Rehearsal & Elaborative Rehearsal
8. Organization
9. Meaningfulness
10. Retrieval

Drawing from the materials provided in Group Activity Package A, give each group the activity package (consisting of an activity card and short readings) appropriate to their assigned/chosen topic. Explain to the students that they must read through the materials provided in order to learn about their topic area. Tell them that when they have done this, they will be expected to explain their respective topics to the rest of the class. Inform the students that they will have 15 minutes to prepare their explanations, which should cover all of the information indicated on their respective activity cards.

While the students work on this task, you should circulate and clarify any problems that come up. Once they have finished preparing, call on the groups, one at a time, to present what they have learned. This presentation phase should take no longer than 30 minutes, since each topic area is quite short. Advise the rest of the class to make notes as each group presents the topics.

Note: An option which you may or may not want to adopt, depending on the mood and character of your students, would be to video-tape their presentations. If you choose this

option, however, you must tell the students that they will be video-taped. Once made, the tape could be used for individualized instruction, remediation purposes, or simple presentation in other classes on Information Processing. The students should be told of these possible reasons for their making a video-tape.

When the above group activity has been completed, you might want to give your students a short break.

Teach & Test 7.1-7.13: Tell the students that now that they have seen how the brain processes information (its workings and its limitations) they can consider strategies that can be used to improve learning and recall. Suggest to them that by understanding the Information Processing system, they can become better learners, and help others to become better learners too. Remind the students of the second memory activity that they did earlier on in the lesson, and of the various strategies that they used in trying to remember the word-list. Inform them that there are many techniques that people use to improve their memories, and that they will be looking at five of these today. Either write the five techniques on the board as follows, or, if you prefer, simply return to page 3 of the advance organizer transparency, where the five techniques are listed:

Strategies for improving learning and recall
- Mnemonic Devices
- Verbal & Physical Activity)
- Ridiculous Associations)
- Minimizing Retrieval-Related Forgetting
- Metacognition

Tell the students that one person in each group must select one of the topics listed. Inform them that because there is not much information to cover in verbal & physical activity and in ridiculous associations, these two areas will be combined into one topic. This means, therefore, that there are 4 topic areas to choose from. Tell the students that they will be going into expert groups to study their chosen topic areas, and then returning to their principle groups to teach their fellow group members what they have learned. (Note: This is essentially the same process that the students experienced in the lessons on Cognitive Theories.) Re-explain to the students how this process works, ensuring that they understand exactly what it is they will be doing. Also, inform the students before they begin the task that they will have 30 minutes to work in their expert groups, and 40 minutes to teach each other in their principle groups. Indicate to the students where about in the room each of the expert groups will be meeting. Owing to the large number of students in the class, 3 expert groups should be formed for each topic area. Drawing from the materials included in Group Activity Package B, give each expert group the activity package appropriate to their chosen area of study. As the students work on this task, you should circulate and clarify any problems that arise. Also check for cooperation among group members.

When the students have finished studying in their expert groups, and return to their principle groups to teach each other, you should provide each principle group with the Group Task Sheet which addresses the 5 strategies for improving learning and recall (See Materials Section), and various Group Product Sheets on which to record their responses. When they have finished teaching each other, and have responded to all the questions on the Group Task Sheets, ask them to sign the Task Sheets and submit them to you. These should be corrected and returned to the students at the next class meeting.

Summary: At lesson's end, summarize what has been covered in the day's lesson. Ask the students if they have any questions or problems, and provide clarification where

necessary. Inform them that next week they will be looking at the teaching applications of Information Processing, and drawing together all that they have studied so far this semester.

Evaluation: As always, the final few minutes of the lesson should be spent evaluating the lesson and filling out the Group Processes form

SUMMARY OF LESSON 4

1. INTRODUCTORY LECTURE - 2 MINS.
2. MEMORY ACTIVITIES #1 & #2 - 10 MINS.
3. HISTORICAL CONTEXT OF INFORMATION PROCESSING - 3 MINS
4. ADVANCE ORGANIZER - 10 MINS.
5. GROUP ACTIVITY TO TEACH AND TEST 6.1-6.18 - 15 + 30 MINS.
6. BREAK
7. JIGSAW-TYPE GROUP ACTIVITY TO TEACH AND TEST 7.1-7.13 - 30 MINS IN EXPERT GROUPS; 40 MINS TO TEACH
8. SUMMARY AND QUESTIONS - 5 MINS.
9. LESSON & GROUP PROCESSES EVALUATION - 10 MINS.

LESSON 5

Topics: Applications of Information Processing
Synthesis of learning theories into classroom practices
Review

Objectives: 8.0 and 9.0 (Terminal Performance Objective)
By the end of this lesson, the students will be able to identify the classroom applications of Information Processing. In addition, they will prescribe appropriate classroom teaching strategies based on all three of the learning theories studied this semester. Finally, any questions the students still have regarding any of the material covered this semester, will be clarified by the instructor.

Time: Two and a half hours

Materials: Group Product Sheets (to be used by groups to record their responses in both of the learning activities described below); Information Processing Key Points student handouts; "From Theory into Practice" Sheets (student handouts, detailing classroom applications of the three main learning theories studied this semester); Lesson Evaluation Sheets, Final Evaluation Sheets, Group Processes Sheets, Attitude Questionnaires.

Introduction: Begin the lesson by telling the students exactly what it is that they will be doing in today's class: Inform them that they will be looking at how Information Processing may be applied in the classroom, and that they will then pull together all that they have learned about Learning Theories this semester. Be sure to let them know that they will also be given time for revision and for asking any questions they might have concerning next week's exam, as this will probably be an area of concern for them.

Teach objective 8.0: Remind the students that when they studied Cognitive and Humanistic learning theories, they looked at the applications that each of these respective theories suggest for classroom teaching. Inform them that they are now going to do the same thing for Information Processing. Tell them that unlike the Cognitive and Humanistic approaches, where they were given a scenario and a list of key theories to match, for Information Processing they will be identifying the applications in a slightly different way. (Note: It is felt that by now, the students will have had sufficient practice with identifying applications to be able to carry out the process without having to rely on an application scenario.) Tell them that, as before, they will be given a list of the key theories, but this time, they will not be given an application scenario with which to work. Instead, they will use the notes they made last week, Chapter 10 of their textbooks and each other (i.e., fellow group members) in order to identify the applications suggested by Information Processing. Before progressing any further, make sure that the students understand what you mean by "applications" (namely, the practices that the theories suggest teachers should do or consider, in order to promote learning in their classes).

Once you have explained the above points to the students, you should ask them to get into their principle ("home") groups. Next, provide each student with a copy of the handout describing the key Information Processing theories, as well as several Group Product sheets (on which the groups will record their responses). It is very important that you tell the students at this point that all of the key points listed in the handout suggest classroom applications, **except** for the basic definitions of Information Processing, the sensory register, the long term memory, maintenance rehearsal, and retrieval. If you neglect to tell them this, you will cause your students considerable frustration, since they will expend

considerable time and effort trying to find applications for these points, where none actually exist. Tell the students that they must consider each of the remaining key points, and that by working with their fellow group members and using the resources available to them (i.e., notes, and Chapter 10 of their text book) they should be able to come up with the practical application(s) that each theory suggests. Demonstrate to the students how to do this by walking them through the following example:

Ask a volunteer to tell you how the process of recognition works. The students will probably recall that recognition is a method of elaborative rehearsal that depends partly on the characteristics of the stimulus itself, and partly on information stored in long-term memory. Tell the students that these two facets of recognition suggests two very important teaching applications, and ask them if they can see what these are. If they cannot identify the two applications, you should tell them: 1. that teachers must present information that is clear, and therefore easy for students to recognize (e.g., charts must be written in clear handwriting; concepts must be explained clearly); 2. that instruction must build on what is already known by the learners (e.g., teach fractions by referring to slices of cake).

Test 8.0: If the students do not seem to have understood the above example of identifying applications from theory, you should present a second illustrative example of the process. Once you are sure that they understand the process, inform them that they have 20-25 minutes to find applications for the remaining key theories. Tell them that they must work as a group, using the Group Product sheets to record their responses. Remind them to sign the sheets when they have completed the task. After the allotted time has passed, take up the groups' answers in class. Ask representatives from each group to share with the rest of the class the applications that they have identified. It is unlikely that the students will have identified all of the appropriate applications listed for objective 8.0. Hence, on taking up the activity, you should inform them of any applications which they have missed, and clarify any misconceptions.

Teach 9.0: Explain to the students that they have now reached the point where they have studied the three main learning theories contained in this instructional unit, and looked at the classroom applications which each of these learning theories propose. Now, they must pull together all that they have learned and see how they can apply it in practice. At this point, you should provide the students with the handout, "From Theory into Practice" (See Materials Section). Explain to them that this handout contains a listing of **all** of the applications that they have studied, from each of the three learning theories. Tell them that often students of learning theories ask the question, "Which theory is best?" or "Which theory should I base my classroom teaching on?" Ask them what they think the answer to this type of question is. If they do not come up with it themselves, tell them that there is no best theory, and that each of the theories is useful to teaching to some degree, since each provides insight into how we, as teachers or educators, can maximize the learning of our students. Point out to the students that although for study purposes they have looked at each of the theories separately, in reality, a combination of all three - actually 4, when we include the behaviourist approach - can be found in the classroom. For example, a teacher might set up her classroom with materials and learning centers to facilitate insight learning (Cognitive), as well as plan activities which encourage her students to have a positive self-concept (Humanism), while at the same time teach her students to use mnemonic devices and other learning strategies (Information Processing).

Next, you should point out to the students that the various approaches, while very different from each other, are not necessarily mutually exclusive. They do, however, suit different learner characteristics, objectives and learning situations, so that one approach may be more **appropriate** for a specific situation, objective and learner than another. Give the students

the example of having a pupil who has a poor self-concept, and ask them which approach would be most useful for solving this problem. They will probably say Humanism. Ask them to imagine that they are teachers who want to promote discussion in their classes; which of the theories suggests effective discussion techniques? (Cognitive (Gestalt)). Continue with this line of questioning, making it clear to the students that their decision to use or not to use a particular application of a particular theory will depend on the extent to which that application is appropriate for the learners, subject matter and learning objectives in question. In addition, it is very important that you point out that it is often necessary to adapt or modify somewhat a chosen application so that it suits the characteristics of the learners and the task in question. Explain, for example, that an educator may decide that facilitating insightful learning is a good idea, but he/she would carry this out in a very different way if the students were in Grade 1 and studying arithmetic, than if the students were in Grade 9 and studying history.

Tell the students that together, you and they are going to look at how the various applications, drawn from all three learning theories studied this term, may be pulled together and used in a classroom teaching situation. Ask a student to suggest a subject matter (something explicit, e.g. teaching fractions -- "Math" is too general). Ask another student to suggest a Grade level, and any other pertinent student characteristics (e.g. entry skills or abilities). Note these down on the board. Next, encourage the students to suggest applications from the sheets that they have in front of them (i.e., the Theory into Practice sheets). You should prompt them to suggest specific ways that applications could be used (e.g., when they suggest, "employ attention-gaining techniques", ask them how you could do this in practice for the particular students and learning task in question). List the students' suggestions on the board, making sure all the time that the applications they suggest are appropriate for the chosen learners and task. Also, encourage the students to choose applications from all three of the principle learning theories. You will probably have to guide the students a little, by asking leading questions, such as, "What if we wanted to increase the creativity of our students..." or "How could we arrange the classroom to ensure X..."

Test 9.0: Once you have collected a fair number of applications in this way, and are sure that the students have grasped the idea of how they might use the applications in a classroom situation, tell the students that what they have just done demonstrates the true purpose of studying learning theories. Explain that, as they can see by the collection of applications on the board, learning theories provide us with a large number of teaching strategies that we may follow, and in this way, help increase student learning. Tell the students that in their groups, they are now going to create a classroom situation, for which they must specify the teaching strategies (i.e., applications) that they would use if they were in a real classroom. You may either provide them with the content, objectives, and learners to be used in the exercise, or allow them to choose these for themselves. Either way, stress to the students that the types of activities and strategies which they suggest for their class **must** be appropriate for the learners, objectives and content which they have chosen/been assigned. Tell them to be sure that they have a good mixture of applications drawn from all three learning theories. Inform them that they will have 30 minutes to complete the task, and that they should record their responses on a Group Product Sheet. (Note: If time is a problem, you may want to limit the students to suggesting, for example, 5 appropriate applications from the Cognitive approach, 3 from Humanism and 5 from Information Processing. Probably a more appropriate approach would be to limit the overall number of applications that they put into their classroom situations, as opposed to specifying how many should be drawn from each learning theory.)

When the students have completed the above exercise, ask them to sign their Group Product sheets and to submit them to you. These must be corrected (according to the

criteria specified by the Terminal Performance Objective) and made available for the students to pick up at some point before taking their mid-term quiz.

Summary and review: This brings to a conclusion the instructional unit on learning theories and the first phase of the cooperative group work that the students will be involved in this semester. You should summarize for the students all that has been achieved, and allow them to voice their opinions and feelings regarding the learning experience as a whole. Remember that closure is very important at the conclusion of this type of learning experience. The students will probably have questions regarding the mid-term quiz. These should be answered, and the students alerted to the basic format of the mid-term quiz.

Evaluation: The remaining time should be spent in evaluation. There are a number of evaluation questionnaires that must be filled out:

- lesson evaluation sheet
- Group Processes form
- Final Evaluation Sheet
- Two-part Attitude questionnaire

SUMMARY OF LESSON 5

1. INTRODUCTION: ALERT STUDENTS TO LESSON'S ACTIVITIES - 2 MINS.
2. TEACH HOW TO IDENTIFY CLASSROOM APPLICATIONS OF INFORMATION PROCESSING - 10 MINS.
3. GROUP ACTIVITY: STUDENTS IDENTIFY CLASSROOM APPLICATIONS OF INFORMATION PROCESSING - 20-25 MINS.
4. TEACH FROM THEORY INTO PRACTICE: APPLICATIONS OF LEARNING THEORIES (CLASS ACTIVITY) - 20 MINS.
5. GROUP ACTIVITY: STUDENTS APPLY LEARNING THEORIES TO A CLASSROOM SITUATION - 30 MINS.
6. SUMMARY AND QUESTIONS - 75 MINS.
7. EVALUATION - 15 MINS.