

ROTATING TEACHING MODELS

by

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ROTATING TEACHING MODELS

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Abstract

Many educators rely upon a single teaching approach to instruction in their classrooms. This presents a problem because such instruction builds a narrow learning environment for students. Teachers who direct classrooms in this manner may experience difficulty in maximizing their instructional effectiveness because they fail to address different learning styles. Further, they fail to promote tolerance for ambiguity, seen by many as a desired aim for teaching.

This study tested the hypothesis that instruction by a rotation of teaching models would better promote student academic growth and tolerance for ambiguity than instruction by a single teaching model. In total, 34 boys and 42 girls from three grade eleven classes were involved in this comparison of different instructional approaches. The study spanned three months during which an experimental group of two classes experienced a rotation of teaching models while a control group of one class experienced only one teaching model. Over this time one teacher taught both groups using six content units. The major instruments administered in the study were Hunt's Paragraph Completion Method, MacDonald's Ambiguity Tolerance 20 Scale, and Hogans's Symbolic Measure of Authoritarianism.

At the conclusion of the study, students exposed to a rotating teaching

strategy demonstrated less tolerance for ambiguity and lower percentage grade scores when compared to students exposed to single mode instruction. Two interpretations may be advanced to explain these results.

One interpretation is that student discomfort introduced by changing teaching strategies obscured the benefits of rotating teaching models. A long term study may better address the confound of discomfort by allowing students time to adjust to each new teaching strategy. A second interpretation of the results is that single mode instruction in fact promotes tolerance for ambiguity and academic performance more so than rotating teaching models. This supports the view that incorporating different teaching strategies on a short term is counter productive, creating discomfort and resistance among students.

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Chapter One Introduction

Some students may understand a concept after they listen to a lecture presentation while others may grasp the same idea just as well merely by reading about it. Some may learn more efficiently by viewing a demonstration, or taking part in an experiment or role play. Still others may gain understanding after involving themselves in a group discussion or in a conversation with another student. If students differ in terms of how they learn, then teachers ought to respond to these differences by using different teaching strategies to efficiently promote student learning. However, this presently does not appear to be a common instructional practice in schools.

This study addresses the concern that too much single mode instruction occurs in classrooms. You may respond to this statement by suggesting this is not really a problem in education, or certainly not one to base a thesis upon. After all, the majority of students are passing courses, graduating and advancing to higher levels. Even so, please consider the following support for my concern. I want you to consider my personal observations as a teacher, observations by students, and supporting viewpoints from educational theorists and planners.

Before turning to these points, consider that high schools currently

experience dropout rates ranging from 14% - 25% across the Canadian provinces. These numbers are being reported in the School Leavers Survey, a 1993 release by Statistics Canada. This dropout rate certainly is the result of a variety of forces, and one of them is students' sheer boredom and disinterest. Is there a common source of this boredom?

As I walk through hallways in my high school, classes are being taught by single mode instruction day after day. For example, in a hallway of eight classrooms observed over three consecutive days, 7/8 were television video or lecture presentation on day one, 8/8 were lecture presentation on day two, and 6/8 were lecture presentation on day three. The remaining three classes were text book questions and seat work. You may say, so what? That is how I was taught. I did OK, so why not them? That may be so, but my doubt and concern over this practice rests on the view that this mode of instruction is a major cause of disinterest and that this three day observation has been consistently present for many years. It is also exemplified in student observations. High school students are veteran participants of the education system. The following quotes are drawn from three student comments in answer to the question "Do you think the school system is preparing you for your future?"

1 ...quite a few people experienced sitting down to write a diploma

exam and noticed that they knew nothing or next to nothing because they slept through the whole course. This can be prevented if the teacher actually puts variety into his/her classes, instead of babbling about little and insignificant details class after class.

2 I'm not trying to say that talking about our history is all bad, but when it is talked about class after class school becomes a bore. I believe that it should be the teacher's responsibility to make their classes interesting. If it's always "read a chapter and do the questions" it gets to be a drag. But if the teachers teach us in a way we can relate to it would make the topic so much more interesting, and when students are interested we strive more and more to be our best.

3 School is not the exciting place their parents promised them but a prison in which the warden is in complete control. The warden will stand before his prisoners and speak of matters of no concern to them, his voice continuous in a monotone, tired pitch. He forgets that he is speaking to a room full of children, essentially, and begins to recite the lesson as he had performed it many times before. The drooping chins and drooping eyes go unnoticed, even the glimmering river of sleep escaping from a student's lips are not seen.

This is the system that forgets about the individual and it fails to recognize the changing needs of today's society. The individual may become another number in the endless statistics of drop outs. This in turn creates a society of men and women pessimistic about their future, their lives. This society searches for a new warden, but not knowing what else to do, follows the old one blindly while not learning anything.

The future is not as bleak as the picture I have drawn for you above for there are still some saviours of mankind out there. They are the teachers who take charge, change a little, bending to the needs of the students first before those of the bureaucrats.

They are innovative in their styles of thought, and teaching, encouraging understanding rather than promoting machines working only to spit out memorized pages from an ancient textbook. They allow for freedom of expression, giving the students a brighter view of the future, helping to form the leaders of the future. These are the ones that are the exceptions. Teachers who fall under this category, will you please stand up?

Five additional student comments are provided in the appendix, which begins on page 77.

As a group, these quotes from students consistently point to repetitious and uninteresting instruction in their schooling. Such a sample of student views in itself does not support my contention that too much single mode instruction is a problem in our educational system. Are there educational theorists that support this view? Joyce and Weil (1986) argue that educators need to employ different teaching models to promote instructional and nurturant effects. In order to do this teachers should develop a repertoire of models. They argue:

Since no single teaching strategy can accomplish every purpose, the wise teacher will master a sufficient repertoire of strategies to deal with the specific kinds of learning problems he or she faces....The teacher's repertoire of models is particularly important if he or she is responsible for teaching many children in several curriculum areas. But even the subject-matter specialist, whose responsibilities may be confined to teaching a single discipline to fairly mature students, faces teaching tasks for which no one single model can be completely adequate . . . To develop a repertoire means to develop flexibility. Part of this

flexibility is professional. Every teacher faces a wide range of problems, and if he or she has an equally wide range of teaching models from which to draw, he or she can generate more imaginative solutions to those problems...can embrace more forms of experience, explore more aspects of his or her students, and find more ways of helping them grow. This satisfaction of growth and exploration should be reason enough for the teacher to set as a goal not one or two basic models to use for all purposes but a variety which he or she explores for the potential they hold for pupils and teachers alike (p. 20 - 21).

This quotation from Joyce and Weil recommends the use of a wide range of teaching models in the classroom. Their point parallels what the students said in their comments. The students voiced the need for variety, flexibility and imaginativeness. Joyce and Weil suggest using a repertoire of models that can deliver content and skills, emphasize personal relationships, depend on the energy of group interaction, and benefit from rehearsal and performance of desirable skills and behaviours. They hope to see an educational environment in which students

...will experience many models of teaching and learn to profit from them. As teachers increase their repertoires, so will students increase theirs and become more powerful and multifaceted learners (p. 22).

Support for the notion I just described also comes from Hunt (1971), who suggests that different class structures will foster more productive learning

environments for different learning styles that exist among students. This view supports the idea that teaching by one strategy alone is not the most beneficial way to meet student needs. Hunt considers the teacher to be the agent most responsible for developing the environment appropriate to the student. Since students possess different levels of ability, teachers should be selecting models to fit the level at which the student operates best. Therefore, different levels of ability will entail the use of different teaching models if teachers are to serve students well.

Educational policy makers have also promoted the desirability of using a range of teaching strategies. Alberta Education (1990) includes this view as one of their major guiding principles holding much promise for education. This body suggests that using a range of strategies will present opportunities to expand student thinking, and help pupils to appreciate the possibilities and limits of various teaching approaches as well as realizing there are several approaches available for them (p. 124). It is also of note that Alberta Education is mandating field trips for all Biology grade eleven level courses in the province beginning in September 1993.

I have attempted to show that my doubt and concern over single mode instruction is supported by student observations, by educational theorists, and by educational planners. Based on this support, I wish to advance a

hypothesis I think is related to the problem, is plausible and is testable. I contend that rotating different teaching models in a classroom will improve student academic achievement and attitudinal qualities over single mode instruction. Joyce and Weil (1986) characterize academic achievement as instructional or direct effects of a teaching strategy. Attitudinal qualities are characterized as nurturant or indirect effects. I would like to focus on one particular student attribute related to the nurturant effect, tolerance for ambiguity.

The hypothesis is that instruction by rotating teaching models will better promote student academic achievement and tolerance for ambiguity than will instruction by a single teaching model.

The research strategy compares an experimental group, exposed to rotating teaching models, with a control group exposed to only one teaching model. The purpose is to examine whether using a variety of strategies on a rotating basis can be significantly more beneficial than using one strategy, and to provide evidence to support the view that teachers need to expand their use of different teaching models for the students' benefit.

This study was carried out in a Calgary high school using one teacher's instructional assignment in social studies from September 1989 to January 1990. It depicts relevant aspects of the teaching and learning which occurred

in the classes involved. Applying the study's results is chiefly limited to the project teacher, but they may be of interest to other teachers who operate under similar working conditions and instructional assignments. The study includes a literature review, a methods chapter, a results chapter, and a discussion.

The literature review gives an historical overview of studies comparing student centered learning with teacher centered learning. Generally, student centered learning involves active participation by students engaged in a variety of educational exercises. Student centered learning is sometimes exemplified by mechanistic, observable and measurable physical activity. Group investigation and dialogue between students are examples. In teacher centered learning, students play a more passive role in the educational process. This is not to suggest that there generally occurs any less valuable or less active cognitive processing among students in a passive role as opposed to an active role. Lecture format is a common example of such teacher centered learning. The student centered learning and teacher centered learning concepts relate to this study because the experimental groups were exposed to teaching models which were primarily student centered, while the control group was exposed to one teacher centered model. Following this historical overview I discuss the concept of discomfort among learners which may be created in a classroom employing rotating teaching models. Background material on the three major

instruments used in the study follows. Six instruments are employed in total, however, only three have relevant literature to review (the remaining three are described in the methods chapter). The three major instruments are Hunt's Paragraph Completion Method (1977a), MacDonald's Ambiguity Tolerance 20 Scale (1970), and Hogan's Symbolic Measure of Authoritarianism (1970a). These were selected because they have all been demonstrated to measure flexibility in thinking and ambiguity tolerance. It is hypothesized that rotating teaching models successfully promote these attributes.

The methods chapter describes the subject pool, the instruments in the study, the procedure which describes the rotation of teaching models, and the expected findings.

The results chapter summarizes the collection and statistical treatment of this study's data. Tables are used to help explain the main effects of the rotation of teaching models on academic growth and tolerance for ambiguity.

The discussion chapter outlines the meaning of the findings reported in the results chapter. The results are interpreted and the findings are applied to the hypothesis. Strengths and weaknesses of the study are included as are theoretical and practical implications for the classroom. A statement suggesting improvements for any further investigation closes the chapter and the paper.

Chapter Two Literature Review

As outlined in the introduction, the literature review begins with an historical overview of studies comparing student centered learning with teacher centered learning. This comparison is included because the experimental groups were exposed to teaching models which were primarily student centered, while the control group was exposed to one teacher centered model. Previous studies similar in nature which may relate to this study will now be reviewed.

A. Previous Studies

The philosophical position which favours adapting instructional methods to individual differences appears in Horace Mann's statements from the 1840's.

He who is apt to teach is acquainted, not only with common methods for common minds, but with peculiar methods for pupils of peculiar dispositions and temperaments and he is acquainted with the principles of all methods whereby he can vary his plan, according to any difference of circumstances. (Cremin, 1957, p. 48)

Mann's observations from approximately 150 years ago suggest that teachers are better served if they are familiar with a wide range of teaching methods. Today, as then, students have different aptitudes for learning. To

deal with these differences, a variety of educational practice and learning environments have developed. Typically these involve different arrangements of student-centered or teacher-centered learning. One major issue in curriculum and instruction is the " . . . conflict over the amount of teacher control considered optimal for student learning. This issue has been actively pursued in educational research. Reviews of studies which vary teacher control have shown mostly conflicting evidence (Anderson, 1959; McKeachie, 1963; Dubin and Taveggio, 1968; Dunkin and Biddle, 1974)." (Porteus, 1976, p. 3).

The following is extracted from the 1959 Anderson review:

Research findings from educational investigations are especially contradictory. We cannot state with any certainty that either teacher-centred or learner-centred methods are associated with greater learning. Some researchers claim superior learning for learner-centred groups (Allport, 1950; Perkins, 1951; Peters, 1948; Sheldon and Landsman, 1950; Thompson, 1957; Bovard, 1952; Brandevin, 1958; Faw, 1949; Flanders, 1951; Newman and Tom, 1957; Zeleny, 1940) . . . a number of investigations have found no difference between learner-centred and teacher-centred methods (Bills, 1952; Deignan, 1956; Eglash, 1954; Farquhar, 1955; Haigh and Schimidt, 1956; Landsman, 1950; McKeachie, 1951; Ostlund, 1956; Rasmussen, 1956; Rehage, 1951; Slomowitz, 1955; Smith and Johnson, 1952; Wispe, 1951) . . . Others reported greater learning in teacher-centred methods (Brookover, 1943; McKeachie, 1954; Asch, 1951; DiVesta, 1954; Anderson, 1956; Burke, 1956; Husband, 1951; Ward, 1956) . . . While some investigations have reported a statistically significant difference favouring one method or other, it is doubtful if

any of these differences are of practical or social significance (Anderson, pp. 207-209).

Anderson agrees with McKeachie:

The published experimental studies are not in agreement and there are a host of unpublished studies which remain unpublished because the two methods used produced no significant differences in outcomes . . . Our hope that either method produces significantly greater long-time benefits is probably unrealistic (McKeachie, 1954, pp. 146-148).

These reviews did not produce conclusive evidence one way or the other favouring one method of instruction. The study reported in this thesis wants to show that varying student centred methods will produce significantly higher achievement and tolerance for ambiguity in students by promoting student activity, interest, and acceptance of new and different situations in which to learn. Ideally, such results would support a more definitive conclusion regarding the efficacy of teacher centered vs student centered learning. It is hypothesized that rotating teaching models, representative of student centered learning, is more effective than single mode instruction.

Previous studies focussed largely on the superiority of one instructional method over another and paid little attention to any possible interactions between the instructional methods and student characteristics (Porteus, 1976, p. 3). This research gap led theorists such as Cronbach to

develop research known as aptitude-treatment interaction (ATI). The term aptitude refers to academic potential and personality dimensions in which students differ; treatment refers to the educational technique (e.g. structured or flexible class) practiced in the classroom. This has become a field of educational research that attempts to determine the best learning conditions for a particular student by considering the interaction between the student's abilities and various teaching methods. Cronbach and Snow (1977) state that students with a high achievement orientation will often do well in a flexible class and enjoy it; students with low achievement orientation do not usually do as well and dislike the flexibility. The reverse is the case in a structured class.

Achievement level is not the only student difference affecting ATI. Brophy (1979) found that one teaching strategy can be superior for lower socio-economic status students, another for higher socio-economic status students. Teachers who work with the latter can be more successful if they try to keep students challenged, not accepting inferior work, and occasionally criticizing the students' work when it does not meet higher standards. Teachers who work with lower socio-economic status students can be more successful by being warm and encouraging rather than demanding. They will praise and encourage often, rarely criticize poor work, and move the curriculum at a slower pace.

There are many academic and social factors affecting both students and teacher in the classroom and this makes researching effects of educational practice difficult. Because these difficulties and complexities did not allow for clearly significant results, the ATI research program moved away from seeking evidence to support general theory and focused on the possibilities for local applicability (Snow, 1977). Referring to the study reported in this thesis, ATI theorists would likely predict no differences between student centered and teacher centered approaches per se. Rather, they would expect an interaction between levels of ambiguity tolerance, student academic achievement, and classroom structure.

Hunt's work (1971, 1977) had a local focus that sought evidence concerning the effects of instructional methods on students in Ontario schools. Hunt speaks of "matching." Match refers to a description of person-environment combinations and their effects on achievement. Where there is little disparity between a person's aptitudes and the objectives and methods of an instructional model, one can assume such congruence or matching will produce high performance, satisfaction and less stress. However, this may also produce a personal learning comfort zone which may in itself promote stagnation and not encourage students to be risk takers. My hypothesis suggests that single mode instruction promotes such comfort zones, leading to

educational stagnation, as Hunt describes.

While some disparity is optimal, a mismatch of person-environment may initially produce decreased performance, dissatisfaction and stress. Hunt stated that a small degree of person-environment disparity will yield more short term results while models which aim for more long term development will promote greater person-environment disparity. My study's design, employing rotating teaching models, is aiming at more long term development by promoting greater person-environment disparity.

Hunt suggested that students had different needs for structure and order, and he measured this with an instrument known as the Paragraph Completion Method (PCM) (1977a). The following is a description of what Hunt's PCM attempted to measure. Conceptual levels in this instrument characterize the organizational structure that a person uses to process or perceive events. It is concerned with how information is processed, not with the content of the information. Higher conceptual levels do not necessarily imply intelligence as measured by I.Q. tests, or even knowledge of facts. Hunt states (1977a), ". . . the specific pattern of relation between conceptual level and ability/achievement is that persons very low in ability/achievement are almost always also low in conceptual level; however high ability/achievement persons vary enormously in conceptual level" (p. 45).

Higher conceptual levels are associated with lower stereotypy, greater flexibility in the face of complex problems and changing situations, greater creativity, exploration behaviour, and tolerance of stress both in oneself and others. In interpersonal terms, higher conceptual levels are associated with greater self-understanding and empathic awareness of others (Hunt, 1971, p. 18). Harvey, Hunt and Schroder explain that, ". . . conceptual evolvement is described in terms of increasing effectiveness of adaptability to change" (1961, p. vi). Developing higher conceptual levels will promote more effective handling by students of uncertain or ambiguous situations. Hence, higher conceptual levels should relate to higher levels of tolerance for ambiguity. Low conceptual level students are dependent on external standards, have difficulty with complex information processing, prefer hierarchical social relationships where roles are clearly defined and exhibit fixed response patterns. High conceptual level students are capable of self-responsible learning, complex information processing, establishing interpersonal relationships easily and consideration of alternative viewpoints. Hunt suggests that low conceptual level students will more likely profit from highly structured classroom environments and that high conceptual level students profit from low structured environments.

Porteus reviewed experimental evidence related to Hunt's work. The

conclusion Porteus drew regarding the work on conceptual level is summarized in the following quotation. "Low conceptual level students tend to benefit from directive teaching while high conceptual level students tend to do better where they have more control over the situation. Cronbach and Snow allow that the evidence about conceptual level is sufficiently consistent to warrant its further investigation" (Porteus, 1976, p. 18). Porteus' summary supports what Hunt previously stated,

. . . the heart of the CL matching model is a generally inverse relation between CL and degree of structure: Low CL learners profiting more from high structure and high CL learners profiting more from low structure, or in some cases, being less affected by variations in structure (Hunt, 1971, p. 44).

Hunt explains why conceptual level theory is potentially useful to educational practice.

Several characteristics of CL theory contribute to its potential value for education: (1) it identifies present information processing skills; (2) it indicates the specific process goals to be developed; (3) it specifies the training environment most likely to facilitate such development; (4) it applies both to students and to teachers; and, therefore, (5) it permits a reciprocal analysis of the teaching-learning process (Hunt, 1977b, p. 2).

Hunt's work on conceptual level is an attempt to assist educators in planning environments that keep students growing conceptually, and to help shape teaching strategies to match the learner's development (Joyce and Weil, 1986,

p. 451). Joyce, Weil, with Showers (1992) state:

Hunt, Joyce and others have engaged in a series of investigations to determine the relationships between conceptual level and student response to a variety of teaching models. . . . In most of the investigations students who varied considerably in conceptual level were taught using models of teaching representing different structures. . . . Generally speaking, the results of Hunt's theories were confirmed by these investigations (p. 100).

Peterson (1977) reported on a study of four classes of ninth grade social studies students taught by a variety of four structure levels: high structure by teacher/high participation by student; high structure by teacher/low participation by student; low structure by teacher/high participation by student; and low structure by teacher/low participation by student. It was found that neither aptitudes nor structure alone contribute significantly to the prediction of achievement, but interactions between them do. "Some students perform better with one instructional treatment, while other students do better with another treatment" (Peterson, 1977, p. 779). Peterson's study is not directly based on Hunt's work, but it analyzes a similar subject age group and its concluding observations support Hunt's view regarding different students performing well in different structures.

Dowaliby and Schumer (1973) report that a student's performance under a structured or teacher-centered approach depends on the student's level

of manifest anxiety. High-anxious students do better in the teacher-centered approach, while low-anxious students do better in the student-centered approach. These findings were independently replicated by another investigator (Domino, 1975).

These conclusions support the view that not all students will perform well under the same approach. The study reported in this thesis hopes to show that providing an opportunity for students to experience a rotation of teaching models will increase their academic achievement and tolerance for ambiguity. Presenting all students with a range of approaches in which to learn will better serve them than will one instructional mode. This study also wishes to explore whether rotating teaching models in the classroom can foster conceptual level development. In doing so, I will be testing the hypothesis that such variation promotes tolerance for ambiguity.

B. Teaching Models

This project uses three classroom approaches, or teaching models. The first, group investigation (GI), is a low structured student-centered environment following the syntax of Thelen's teaching strategy as outlined in Joyce and Weil (1986). Herbert Thelen's works on group dynamics (1954) and Education and the Human Quest (1960) forms the underpinnings of this model. "This teaching role is a very difficult and sensitive one,... at the same

time the instructor must (1) facilitate the group process; (2) intervene in the group to channel its energy into potentially educative activities; and (3) supervise these educative activities so that personal meaning comes from the experience" (Thelen, 1960, p. 136). Joyce, Weil with Showers (1992) state, "Intervention by the instructor should be minimal unless the group bogs down seriously" (p. 49).

Group investigation requires flexibility from the teacher and enough common values and academic experience among students to make communication fairly easy. It also requires enough differences to generate alternative opinions and reactions. Group members should also possess approximately the same levels of previous exposure to the knowledge area being investigated. If the range is too great, the levels of conceptualization will very likely be too far apart to enable the group to relate productively (Thelen, 1960, p. 157).

The second approach, the communication forum (CF), is a moderately structured environment adapted from William Glasser's "Classroom Meeting" strategy. This classroom meeting model is based on Glasser's books, Reality Therapy (1965) and Schools Without Failure (1969). "The meeting is a time when students and teacher join, preferably daily, in an open-ended, non-

judgemental discussion of . . . academic or curriculum issues" (Joyce and Weil, 1986, p. 208). Glasser states,

It is important, therefore, in class meetings for the teacher, but not the class, to be non-judgemental. The class makes judgements and from these judgements works toward positive solutions. The teacher may reflect class attitudes but he/she should give opinions sparingly and be sure the class understands that his/her opinions are not law (Glasser, 1969, p. 131).

After the class meeting, the intent of which is to promote puzzlement, students then break into dyads. The student, with his/her learning partner, will follow through on the issues and materials discussed.

The third approach, the advance organizer (AO), is a highly structured teacher-centered environment organized to convey information efficiently to a class of students. This model is based on the works of David Ausubel and his writings in Educational Psychology: A Cognitive View (1968) and The Psychology of Meaningful Verbal Learning (1963). Joyce and Weil comment: "Ausubel disagrees with the belief that meaningful material cannot be 'presented' but must come through independent problem-solving and manipulative experience" (Joyce and Weil, 1986, p. 73). Ausubel describes advance organizers as introductory material presented ahead of the learning task and at a higher level of abstraction than the learning task itself. Its purpose is to explain and integrate the material in the learning task with

previously learned material . . . (Ausubel, 1968, p. 148). Joyce and Weil add:

The successful acquisition of the material will depend on the learner's desire to integrate it with prior knowledge, on their critical faculties, and on the teacher's presentation and organization of the material. . . . Ideally, students will initiate their own questions in response to their own drives for meaning (Joyce and Weil, 1986, pp. 82-83).

The three teaching models selected for use in this study serve the purpose of providing a range, variety, and contrast of classroom structures, and an environment in which to test the hypothesis. Does variation of these classroom approaches promote tolerance for ambiguity more effectively than using only one teaching approach in a classroom?

C. Discomfort In Learning

Employing a variety of teaching models in a classroom will create discomfort at one point or another for students. Some will not feel safe in a new learning environment. Rogers (1961) argues that our natural tendency as learners is to perform better in domains that already feel safe. However, like Thelen and Hunt, Rogers also states that in order to grow, learners have to acknowledge discomfort and set tasks to help break the barriers of fear. Thelen suggests that a learner does not learn unless he does not know how to respond. He says real growth requires teachers to make learners uncomfortable so they can discover and react to basic conflicts within their

own attitudes and sets (Thelen, 1960). Hunt (1971) speaks of deliberately mismatching student and environment so that familiarity and comfort zones can be broken. This will assist in advancing the learner toward more complex development. Joyce and Weil (1986, p. 440) add that,

. . . significant growth requires discomfort. If the environment and the student are too much in harmony, the student is permitted to operate at a level of comfort that does not require the challenge of growth. . . . Rather than matching teaching approaches to students in such a way as to minimize discomfort, our task is to expose students to new teaching modalities that will for some time be uncomfortable to them.

Experiencing significant discomfort within a learning environment is described by Joyce and Weil as marginality:

Marginality is a condition that exists when a learner has difficulty relating to an educational environment and profiting from it. . . . The theoretically possible range of marginality is from none (when the learner relates productively to all of the environments to which he or she is exposed) to all (when the learner experiences virtually no environments that are productive for him or her). (Joyce and Weil, 1986, p. 440)

The study reported in this thesis is not measuring marginality or discomfort, but their existence within this study's classroom environments must be recognized, for they have potential to effect change in student tolerance for ambiguity and academic performance. If there is too much or too little

discomfort present, student learning may be impeded. There should be an optimal amount of student discomfort present for a productive environment to exist. Rotating teaching models employed in this study should produce discomfort in participants. If Thelen's and Joyce and Weil's assertions are accepted, that real growth requires teachers to make learners uncomfortable, then the variation of teaching models should help produce that discomfort and subsequently the opportunity to break down rigidity and promote tolerance for ambiguity.

D. Instruments

Six instruments were used in the study. The first three have relevant literature associated with them and they will be discussed in this chapter. As outlined in the introduction, the remaining three will be discussed in the methods chapter. The instruments appear in the appendix for reference, with the exception of the achievement tests.

1. Scale for Ambiguity Tolerance (AT20)

Measuring ambiguity tolerance can help pinpoint discomfort in learners. Students are more likely to experience discomfort if they have low tolerance for ambiguity. So, if a teacher can measure ambiguity tolerance, he or she can identify and monitor students who may not come forward with

expressions of frustration in the classroom. English and English define ambiguity tolerance as a

. . . willingness to accept a state of affairs capable of alternate interpretations, or of alternate outcomes; e.g. feeling comfortable (or at least not feeling uncomfortable) when faced by a complex social issue in which opposed principles are intermingled. Low ambiguity tolerance is shown by the desire to have everything reduced to black and white . . . (1958, p. 24)

Budner (1962) defines tolerance of ambiguity as the tendency to perceive ambiguous situations as desirable. He defines an ambiguous situation as one characterized by novelty, complexity, or insolubility. If an individual exhibits anxiety and discomfort, destructive or avoidance behaviour in such situations, it would seem reasonable to infer that the individual has low tolerance of ambiguity (p. 30). He suggests that this is characterized by perceiving situations in terms of black and white and exhibiting marked rigidity in coping behaviour. Relating this to the hypothesis and the research strategy, we would expect to find lower ambiguity tolerance scores in the control group and higher scores in the experimental group. This is expected because the rotation of teaching models exposing students to different learning environments should stretch their coping behaviours and their abilities to deal with new and ambiguous situations.

Other investigators such as Rydell (1966), MacKay and Bever (1967) and Norton (1975) have reported on studies involving levels of ambiguity in subjects. Norton reports on another reliable and valid measure of ambiguity tolerance, the MAT 50, with high internal reliability ($r = .88$) and high test-retest reliability ($r = .86$) over a three month period.

Tolerance of ambiguity, or lack of, has been linked with other characteristics. Frenkel-Brunswik (1949) speaks of a ". . . tendency to resort to black-white solutions, to arrive at premature closure as to evaluative aspects, often at the neglect of reality, and to seek for unqualified and unambiguous overall acceptance and rejection of other people" (p. 115). Students with low tolerance of ambiguity may then experience difficulty working with peers in pairs or in groups. It is hoped that rotating teaching models in my study will break down such propensity in students. Students in the experimental classes will hopefully expand on their ability to tolerate ambiguity in a situation or in a stimulus. This is seen as a desirable goal because as time passes, greater numbers of people are viewing greater numbers of fragmented interpretations of their surroundings, these being presented by brief 15 or 20 second media bites. People with low tolerance of ambiguity may tend to react with anxiety or dismissal and withdrawal from such situations. This behavior has been hypothesized to be an aspect of the authoritarian personality, which is linked

to servile acceptance of authority (Reber, 1985, p. 70). It would seem that rather than promote obedience to authority, the classroom should be promoting questioning of authority in order for authority to justify its position both in the classroom and in society in general.

Allport's 1954 book, The Nature of Prejudice, also ascribes the characteristics of closed-mindedness towards other people and prejudgment to individuals with low ambiguity tolerance (Rydell, 1966, p. 1303). Budner reports his ambiguity scale correlated positively with authoritarianism (1962, p. 50) and authoritarianism and ethnocentrism is linked to low tolerance of ambiguity in the Adorno, et al. (1950) book, The Authoritarian Personality. We can relate this to the classroom when Adorno states, "the avoidance of ambiguities and the rigidity of mental sets in the ethnically prejudiced also becomes evident in the handling of perceptual and other cognitive materials . . ." (Adorno, 1950, p. 481).

The Ambiguity Tolerance 20 Scale used in this study was developed and validated by MacDonald, Jr. at West Virginia University, and measures a subject's tolerance for ambiguity. It includes 20 statements to which students answer True/False, giving a range of 0-20 (0 representing intolerance of ambiguity). Based on administering the AT20 to 789 undergraduate students at Ithaca College, MacDonald obtained a reliability estimate of .63 for the test

with a mean of 10.51 for the total group. Test-retest reliability was .63 ($p < .01$) for a six month interval. The internal consistency estimate was computed at .86. MacDonald states that the AT20 can be a useful instrument for the measurement of ambiguity tolerance as it has shown " . . . reasonably good internal consistency and rather high retest reliability . . ." (MacDonald, 1970, p. 797). This is why the AT20 was selected for use. It is brief and measures one of the attributes stated in the hypothesis, namely tolerance for ambiguity.

2. Symbolic Measure of Authoritarianism (SMA)

Designed and validated by Hogan at Tulane University, this scale measures a subject's disposition to authoritarianism. Based on 15 pairs of line drawings and number arrangements, the subjects make a choice from each of the 15 pairs, giving a scoring range in this study of 0-15 (0 representing greater authoritarianism, or low tolerance for ambiguity). "The selection of one figure or digit arrangement from each pair is considered more indicative of intolerance of ambiguity, hence authoritarianism" (Hogan, 1970a, p. 40). Hogan's test is designed to create a symbolic measure more efficient and administrable than verbal tests, such as the one designed by Adorno et al. (1964), who is well known for work on authoritarian personalities. Hogan found a .64 correlation between his test and Adorno's at a .006 level of

confidence. "Persons who score high on the Adorno F-Scale also tend to endorse those items of a symbol test which are most elicitable of the authoritarianism-related phenomenon of intolerance of ambiguity" (Hogan, 1970c, p. 218). Hogan reports reliability coefficients of .93 and .91 for two groups of American undergraduates using the Symbolic Measure of Authoritarianism; .88 and .84, respectively, for 285 German soldiers and 83 German law students. The construct validity of the Symbolic Measure of Authoritarianism is indicated by "known-group" scores of 1.0 for American prison guards, 5.9 for American undergraduates, and 7.0 for American social work students. The Symbolic Measure of Authoritarianism assesses the same construct as the Ambiguity Tolerance 20 scale, tolerance for ambiguity. This will increase confidence in measuring a major focus of the study's hypothesis, namely that rotating teaching models will produce greater tolerance for ambiguity.

3. Paragraph Completion Method (PCM)

Based on subjects' written sentence answers to six open-ended topics, the Paragraph Completion Method (Hunt, Butler, Noy and Rosser, 1977a) is designed to obtain a sample of how respondents handle conflict or uncertainty and how they think about rule structure and authority relations. It is scored 0-3 (3 representing high conceptual level). Hunt (1977a) gives directions to

administer and score the Paragraph Completion Method. It is a lengthy process as all student responses are in sentence form. There are no multiple choice items in the instrument. Hunt says,

It would be more convenient if it were possible to assess CL through an objective test which could be easily scored. Although numerous attempts have been made to devise objective measures, none of them has proven satisfactory . . . a thought sample is required to assess how a person thinks (1977a, p. 2).

Based on several thousand persons' scores, Hunt reports a general conceptual level increase with age, considerable conceptual level variation at all grades, and considerable variation between schools at the same grade. Test-retest coefficients over one year range from .45 to .56. For shorter time intervals, i.e. three months, a test-retest r of .67 has been reported. The only appropriate method of validating a developmental construct such as conceptual level is through a longitudinal approach (Hunt, 1977a, pp. 42-49). Conceptual level does not change quickly in people.

The Paragraph Completion Method is the third measure being used in this study to assess tolerance for ambiguity. Measurement of conceptual level assists in identifying tolerance for ambiguity and acceptance of authority among this study's subjects. Does variation in teaching models promote or deter conceptual level development in students, thus promoting or deterring

how they handle uncertainty and ambiguity?

To summarize, this literature review presented previous studies comparing student centered and teacher centered approaches. The results previously reported have been inconclusive, so the study reported in this thesis hopes to provide a more definitive conclusion supporting student-centered learning as being a more productive approach in the classroom. A review of Hunt's research suggests that conceptual level growth requires creating person-environment disparity. I hope to do this by rotating teaching models in the experimental classes in this study. As both Hunt and Thelen argue, person-environment disparity should make students uncomfortable, which Joyce and Weil describe as discomfort. This discomfort is necessary for real student growth, both cognitive and affective, to occur. Thelen states that this discomfort needs to be acknowledged by learners so they can discover and react to basic conflicts within their own attitudes. The study reported in this thesis supports the idea that rotating teaching models will provide the impetus for such a situation to develop in the classroom. The academic progress and attitudinal development which may occur requires measurement. The literature review closed by presenting the validity and reliability of the three major instruments employed to measure the anticipated change in tolerance for ambiguity.

Chapter Three Method

A. Introduction

The study required the approval of the school system's Assistant Superintendent for Student Services and the building principal. After consultation with both superiors regarding the scope and content of the project, approval was granted and a teaching schedule was arranged to suit the study's requirements. No consent forms for the subjects were deemed necessary by Student Services. However, it was stipulated that each subject be informed prior to participation that inclusion was entirely voluntary and that any subject could have access to any results the study may produce. This was done and the subjects were given a general overview of their role. No students declined participation. The study ran from September 8, 1989 to December 21, 1989.

B. Subjects

The subjects were students attending Bishop Grandin High in Calgary, Alberta. The school's enrolment fluctuated between 1485 and 1510 through the duration of the project. In total, 76 students in three grade eleven social studies classes made up the sample. The 34 boys and 42 girls ranged from 15 to 17 years of age. Classes one and two were the experimental groups in which the rotation of teaching models occurred, and class three was the

control group in which no rotation occurred. Class one (22 students) had a male/female split of 9/13; class two (26 students) had a male/female split of 12/14; class three (28 students) had a male/female split of 13/15. These three groups were mainstream classes in the school's programming. Also taking instruction in grade eleven social studies during this time period were two remedial classes, one advanced class and one other mainstream class. The two remedial classes' registrations were based on teacher recommendation and previous weak performance. The one advanced class registration was based on written applications from students who possessed above average interest and/or ability in social studies. The four mainstream classes' registrations, including those in this study, were based on random selection from the remainder of the school's grade eleven social studies enrolment. It is important to note that because the low and high end streaming was limited in number of registrations, and that these registrations were voluntary by students, the mainstream classes still contained a wide range of ability and were representative of the school's general population.

C. Instruments

The six instruments used in the study appear in the appendix with the exception of the achievements tests. They are: (1) MacDonald's Scale for Ambiguity Tolerance, designed to measure tolerance for ambiguity; (2)

Hogan's Symbolic Measure of Authoritarianism, also intended to measure tolerance for ambiguity; (3) Hunt's Paragraph Completion Method, intended to measure conceptual level; (4) a Polarity Scale on Teaching, intended to gather subjects' general perceptions of the occupation of teaching; (5) a Polarity Scale on Class Structure, intended to gather the experimental subjects' general perceptions of the three teaching models they participated in; and (6) a set of achievement tests (73 pages), designed to measure the subjects' academic performance. Also, the technique of employing an external monitor was incorporated into the study. This was designed to provide a check on the consistency of the procedure. The first three instruments were discussed in the literature review and they are most directly linked to testing the hypothesis. The last three are instruments I developed in whole or in part for use in this study. These three instruments will now be described in the following three paragraphs.

The Polarity Scale on Teaching is a list of 14 word pairs intended to gather the subject's general perceptions of the occupation of teaching. It was designed to give a measure of whether or not rotating teaching models affected the subjects' perceptions of the occupation of teaching. The subjects marked a seven point scale located between each of the 14 word pairs, giving total possible scores ranging from 14 to 98. For example, each subject marked one

of seven boxes located between the words rewarding and unrewarding to describe their general impressions of the profession of teaching.

The Polarity Scale on Class Structure was similarly constructed using 7 word pairs, giving total possible scores ranging from 7 to 49. It intended to gather the experimental subjects' general perceptions of the three teaching models they participated in. For example, each subject marked one of seven boxes located between the words useful and useless to describe their general impressions of a teaching model. The bipolar scales on teaching and class structure were not designed to directly test the hypothesis. Rather, they were employed to gather qualitative information about the subjective experiences of the students.

The final instrument was a set of six achievement exams, one for each teaching unit in the study. They were composed of multiple choice items and were designed to measure the academic performance of each subject in each teaching unit. They were scored in percent and covered these topics: French Revolution, Industrial Revolution, Ideologies, World War I, Diversity, and Interdependence. The test items were a compilation of my writings (approximately 80%), and questions from curriculum projects and government items banks (approximately 20%).

The monitor technique was a random schedule of classroom

observations by a colleague. This was designed to regulate the study's procedure. The monitor visited randomly throughout the term to reinforce the delivery of the research strategy. The monitor entered the classroom without notice and observed the delivery of the selected teaching models, noting whether the delivery was consistent over time. The monitor also observed whether the rotation of these models followed the intended schedule for the experimental and control classes. Each of the nine visits ranged from five to thirty minutes in length. The monitor had been briefed regarding the syntax of each model and the overall goals of the project prior to the observations. I wanted an external monitor involved in the study to counter potential criticism that the rotation of teaching models was not verifiable, so that what occurred in the experimental and control groups was not based solely on the project teacher's word. The monitor's role was to assist in alleviating this research problem. Also, the scoring of all instruments occurred only after the study's classes disbanded. Such monitoring and planned ignorance of results addressed the problem of unintentional researcher bias. This follows several researchers in the social studies, where observations of instruction were performed to check on the implementation of the independent variable (Shaver, 1991, p. 71).

D. Procedure

At the outset of the study, the three classes' pre-requisite grade means were examined and were found to be similar for the purposes of statistical comparison. Classes one and two formed the experimental group and class three, the control group. A rotating schedule of three different teaching models was implemented in classes one and two. The teaching models employed were: a low structure social model - group investigation (GI); a moderate structure personal model - communication forum (CF); and a high structure processing model - advance organizer (AO).

For the group investigation model, subjects were initially instructed in its format and goals. I then randomly assigned students into their discussion groups, each with three or four students. I gave few reviews of material or summaries. The students worked only within their groups. I asked few questions and avoided answering student questions as much as possible. This aimed to promote reliance on the group and independence of the learner. Therefore, wherever possible, student questions were responded to by teacher questions, not teacher answers.

For the communication forum model, subjects were initially instructed in its format and goals. The students worked with one other person of their choice. I gave few reviews of material or summaries. The class

structure was moderate, with student pairs conversing about the material being studied as the teacher directed a 12 to 15 minute question session each day. Student answers were not confirmed by myself. Rather, they were evaluated for accuracy by other students. The remainder of time was spent in pairs, each student working with their learning partner.

For the advance organizer model, subjects were initially instructed in its format and goals. The students worked individually. I gave reviews and summaries of material. Stating important points and organizing the lessons with little requirement for student participation, I presented material and would answer and confirm student initiated questions. Students were not required to interact with anyone else and I would not call upon any subjects to respond to questions.

The rotation of models schedule for class one was GI, AO, CF, AO, CF, GI. The rotation of models schedule for class two was AO, GI, AO, CF, GI, CF. There was no rotation schedule for class three, the control group. Their class structure was AO, AO, AO, AO, AO, AO. The research instruments administered on September 8 and December 21 were sealed in envelopes on each of those days by the building principal. This ensured that I had no access to scores during the study or prior to the conclusion of course instruction. The study ran for 15 weeks and was composed of six 2½ week

teaching units. The classes each met six times per week for lengths of 67 minutes. Each teaching unit coincided with the rotation of the models. The course content was constant through all three classes, and the project involved only one teacher in the delivery of the teaching models. All final grades of students in all three classes were submitted before any instruments were scored. Inadmissible data occurred because of subject prolonged illness, moving, late entry, withdrawal, or suspension. Scoring of instruments did not begin until the conclusion of the course instruction in January, 1990.

E. Expected Findings

Subjects in the experimental group were expected to generate higher scores than subjects in the control group on MacDonald's AT20 Scale measuring tolerance for ambiguity because of the rotating teaching models. Similar results were expected for Hogan's Symbolic Measure of Authoritarianism, which also assessed tolerance for ambiguity. Higher scores in the experimental groups were also expected when scoring Hunt's Paragraph Completion Method which measured conceptual level. However, it must be noted that Hunt stated conceptual level growth is a long term process, taking many years. Therefore, the degree of growth in conceptual level in the study reported in this thesis may in fact be minimal or insignificant. Even so, it was hypothesized that the rotation of teaching models would positively promote

such a construct. The Polarity Scale on Teaching was expected to reveal significantly more positive growth in the experimental groups than in the control group. The Polarity Scale on Class Structure was expected to yield positive feedback from the experimental groups about the two student centered models they were exposed to, and ambivalent or negative feedback about the teacher centered model they participated in. Higher scores on all the achievement exams were expected in the experimental classes because rotating teaching models were expected to generate greater interest level and desire to focus upon and learn the course material. This would then foster an environment conducive to positive learning experiences which would raise exam scores significantly over the control group's scores, despite the fact Ausubel (1968) would predict the control group should score higher. The monitor was expected to report adherence to the study's procedures in both experimental and control groups.

Generally, the rotation of teaching models used in the experimental group was expected to promote more growth in ambiguity tolerance, higher conceptual level scores, and better academic performance than in the control group. The rotation was expected to generate a more positive outlook toward teaching among subjects in the experimental group. It was also expected they would respond more favourably to the student centered models than the teacher

centered lecture based model.

F. Methodological Notes

Before presenting results obtained from the research instruments, I will include a brief explanation of the statistical methods used to test the hypothesis. The following information is only being offered for those readers who may not be familiar with these statistical methods, and these notes are only intended to help serve as a set of examples or as background material for reading the results chapter. This explanation begins by investigating the relationship between independent and dependent variables. A variable is anything that can take on more than one value (e.g. a % final grade). An independent variable is the variable that is manipulated in a controlled fashion by the experimenter or researcher (e.g. class structure level). A dependent variable is the variable the researcher expects to be influenced by the manipulation of the independent variable (e.g. AT20 score or CL score). Generally, three types of statistical tests are employed to examine this study's hypothesized relationship between independent and dependent variables; t-testing, Pearson correlation, and analysis of variance (ANOVA).

The t-test is a form of hypothesis testing. It is the most widely employed technique of statistical inference in educational and behavioural research (Glass and Hopkins, 1984, p. 222). It is based on two assumptions:

(1) the samples are randomly drawn from normally distributed populations, and
(2) the populations have the same variance. The t-test will detect the presence of significant differences between two samples at a stated level of probability, usually the .05 level.

The Pearson product-moment correlation r is the most common measure of the degree of relationship between variables. The degree of relationship can vary from -1.0 to $+1.0$. The magnitude of the relationship is indicated by the absolute value of the correlation coefficient (Glass and Hopkins, 1984, p. 107). Generally, correlations below .5 are considered low, .5 to .85 moderate, and above .85 high. The magnitude of r is affected by the variability of the sample. Homogeneous scores produce a lower value of r , heterogeneous scores produce a higher value of r . A positive correlation indicates that (e.g.) high scores on test A are associated with high scores on test B, and that low scores on test A are associated with low scores on test B.

Analysis of variance (ANOVA) has been called the "work horse" for comparative studies in educational and behavioural sciences (Glass and Hopkins, 1984, p. 325). Analysis of variance is used to determine whether the difference between two or more means are greater than would be expected from sampling error alone.

A one way analysis of variance examines the means of two or more

groups and only one independent variable. For example, a one way analysis of variance can examine the effects of different class structure levels (the independent variable) on ambiguity tolerance (the dependent variable).

A two way analysis of variance examines the effects of two independent variables and their interaction between each other. An interaction is present when the effect of one variable depends upon the level of the other variable. For example, if the effect of class structure level is different for high and low conceptual level students, then an interaction is present. There is a main effect for class structure level if students in high class structure score differently than students in low class structure on a dependent measure (e.g. a test). There is a main effect for conceptual level if high conceptual level students score differently than low conceptual level students on a dependent measure. An interaction is present if high conceptual level students score differently than low conceptual level students in different structure levels (people with different aptitudes will perform differently within different environments, also described as aptitude treatment interaction).

The Statistical Package for the Social Sciences (SPSS^x) was employed in the analysis of the data presented here, with the assistance of Dr. G. Alder in the Department of Psychology at The University of Calgary. The steps to compute these tests are described in Glass and Hopkins (1984).

Chapter Four Results

Initially, I examined the level of achievement of the students before the experiment began. This is important to do because if one class possessed a significantly different pre-requisite grade mean, it would be very difficult to draw any valid conclusions based on standard statistical comparisons. The pre-requisite means in per cent were: Class 1, 65.45; Class 2, 65.04; Class 3, 66.79. An analysis of variance of the three classes' pre-requisite grades revealed no significant difference at the .05 level, $p=.783$. Therefore, the three classes were similar for the purposes of statistical comparison.

The findings generated by each instrument used in the study will now be presented. These results intend to show whether or not the research strategy of rotating teaching models actually produced significant differences between the experimental and control groups, given the hypothesis that rotating different teaching models in a classroom will improve student achievement and attitudinal qualities over single mode instruction. The findings are broken into four sections; tolerance for ambiguity, achievement, attitude, and monitoring.

A. Tolerance for Ambiguity

Tolerance for ambiguity is a construct describing an individual's ability to tolerate ambiguous situations, uncertainty, and alternate

interpretations. Joyce and Weil (1986) may characterize a quality such as tolerance for ambiguity as a nurturant or indirect effect of a teaching strategy, as opposed to an instructional or direct effect of a teaching strategy. Tolerance for ambiguity was measured by the Ambiguity Tolerance 20 Scale, the Symbolic Measure of Authoritarianism, and the Paragraph Completion Method. The results from these measures are presented in Tables 1 through 4.

The numerical scores in Table 1 compare favourably to the scores recorded in MacDonald's studies when using the Ambiguity Tolerance 20 Scale. The range of 0-20 means that a score of 0 would be extremely low tolerance of ambiguity while a 20 would represent extremely high tolerance of ambiguity. The September $p = .801$ signifies very similar scores among classes, while the December $p = .402$ also represents, though to a lesser extent, similar scores among classes.

The analysis of the pre and post Ambiguity Tolerance 20 Scale data, shown in Table 1 by class, revealed no significant differences to report at the .05 level. Ambiguity tolerance scores remained stable in the experimental classes (1 and 2) and the control class (3). This does not support the hypothesis that the experimental group would experience significant growth in tolerance of ambiguity.

The second measure of ambiguity tolerance involved the Symbolic

Table 1

Ambiguity Tolerance 20 Scores by Class

Class	<u>September</u>	<u>December</u>
1	8.23	7.82
2	8.85	9.08
3	8.57	8.00

Note: Range 0-20. September analysis of variance $F(2,67) = .222$ $p < .05$ $p = .801$. December analysis of variance $F(2,67) = .923$ $p < .05$ $p = .402$.

Measure of Authoritarianism. The scores from the September and December tests are shown in Table 2. It can be seen that the data yielded no significant differences by class. It was expected that classes 1 and 2 would score significantly higher on the Symbolic Measure of Authoritarianism than class 3. Significantly higher scores would represent a shift toward higher levels of tolerance of ambiguity. This did not occur in the experimental classes according to the data collected. In fact, the experimental classes' pre/post difference in Table 2 (-0.69) indicates movement toward less tolerance for

ambiguity while the control class difference (+0.61) indicates movement toward greater tolerance for ambiguity. Though not statistically significant, this was unexpected given the hypothesis that rotating teaching models would increase tolerance for ambiguity.

Table 2

Symbolic Measure of Authoritarianism Scores by Class

Class	<u>September</u>	<u>December</u>
1	7.05	6.09
2	7.42	6.96
3	7.14	7.75

Note: Range 0-15. September analysis of variance $F(2,67) = .003$

$p < .05$ $p = .997$. December analysis of variance $F(2,67) = 1.794$

$p < .05$ $p = .174$.

The t test scores reported in Table 3 are based on the change in conceptual level scores within class. This was done to analyze the change

between September and December scores. The analysis was done to assess whether rotating teaching models significantly influenced conceptual level growth, differentially between control and experimental groups. No significant differences in conceptual level scores across classes were found, as shown in Table 3. This data also shows that while there was no significant difference between the conceptual level scores of any of the classes, all three classes' conceptual level scores grew, with classes 1 and 3 showing significant growth. This does not support the expected findings that the experimental group's increases would be significantly higher than the control group's. The rotation of teaching models did not significantly alter conceptual level growth when compared to single mode instruction.

Table 4 reports pre and post conceptual level score differences for low and high conceptual level groups by class. The table presents information to assist reviewing Hunt's statements concerning the relationship between conceptual level and class structure, namely that low conceptual level students profit from high structure, as seen in the control class, and high conceptual level students profit from lower structure, as reflected in the experimental classes. Statistical analysis of Table 4's data revealed significant growth for all low conceptual level groups. The high conceptual level groups in the experimental classes reported lower post conceptual level scores while the high

Table 3

Conceptual Level Scores by Class

Class	<u>September</u>	<u>December</u>	<u>Change</u>
1	1.45	1.61	.1600
2	1.56	1.63	.0712
3	1.47	1.60	.1254

Note: Range 0-3. Class 1: $t(21) = 2.32$ $p < .05$.

Class 2: $t(25) = 1.18$ $p \neq .05$. Class 3: $t(27) = 2.52$ $p < .05$.

conceptual level group in the control class reported slight growth. This does not support the expected findings that both low and high conceptual level groups in the experimental classes would experience significant growth, nor does it support Hunt's inverse relationship. In fact, the high conceptual level group's scores in the experimental classes declined.

B. Achievement

Student academic achievement was measured by percentage grade

Table 4

Conceptual Level Growth by Class and Conceptual Level Group

Class	Low CL Growth	High CL Growth
1	.34	-.11
2	.30	-.14
3	.32	.04

Note: Range 0-3. Low CL group includes student scores 1-1.4 and high CL group includes student scores 1.8 and above on September's Paragraph Completion Method.

scores, gathered from each class for the six curriculum units taught over the three month study. Joyce and Weil (1986) may characterize student academic achievement as an instructional or direct effect of a teaching strategy, as opposed to a nurturant or indirect effect of a teaching strategy. These achievement test results are presented in Tables 5 and 6.

An analysis of variance on the achievement test results by class for each of the six teaching units revealed no significant differences between the experimental classes exposed to rotating teaching models, and the control class not exposed (see Table 5). Again, this does not support the hypothesis that the experimental classes, subjected to rotating teaching models, would produce

Table 5

Achievement Test Percentage Results by Class and Teaching Unit

Class	Teach -ing Unit	1	2	3	4	5	6
1		56.77	65.63	65.18	55.31	69.36	65.36
2		59.65	67.65	62.61	50.15	69.38	56.30
3		56.89	71.46	65.42	60.96	72.64	55.21

Note: Range 0-100%. Teaching units (1): $p = .660$, (2): $p = .137$, (3): $p = .690$, (4): $p = .115$, (5): $p = .542$, (6): $p = .076$. The analysis found no significant differences at the .05 level.

significantly better exam results than the control class.

Table 6 presents achievement test average scores by class and conceptual level. No significant difference between experimental and control classes' scores by low conceptual level groups is reported, but a significant difference is reported among high conceptual level groups (see Table 6). High conceptual level students scored significantly better in the control class exposed to one teaching model than in the experimental classes exposed to rotating teaching models. Table 6 also shows that the control class produced the highest achievement test average scores for both low and high conceptual level groups. This does not support the hypothesis that the experimental classes would score better than the control class. Rather, it is supporting the view that the control class produces better academic scores for both low and high conceptual level student groups.

After analyzing the ambiguity tolerance and achievement data, statistical tests were run to determine if any correlations existed between subject ambiguity tolerance scores and achievement test scores. I wanted to assess whether students with high ambiguity tolerance scores in fact scored better on achievement tests than students with low ambiguity tolerance scores. I also wanted to know if there was any correlation between ambiguity tolerance scores and conceptual level growth, and whether the correlation between these

Table 6

Achievement Test Average Percentage Scores by Class and Conceptual Level

Class	Low CL Group	Moderate CL Group	High CL Group
1	59.10	64.10	67.68
2	57.80	62.78	61.89
3	62.59	58.73	74.98

Note: Range 0-100%. Low CL group, experimental versus control (59.10 and 57.80 vs. 62.59) $F(1,67) = 1.02$ $p < .01$. High CL group, experimental versus control (67.68 and 61.89 vs. 74.98) $F(1,67) = 370.3$ $p < .01$.

variables was different between experimental and control groups. A significant negative relationship was found between subjects' Ambiguity Tolerance 20 average scores and achievement test average scores, $r[74] = -.286$ $p < .01$ $p = .006$. Low Ambiguity Tolerance 20 scores are correlated with higher average test scores. Further, an analysis of variance on a median split of Ambiguity Tolerance 20 scores found a significant difference between low and

high Ambiguity Tolerance 20 groups' average test scores ($F[1,70] = 4.165$ $p < .05$ $p = .0450$). The low Ambiguity Tolerance 20 group's average score was 64.25%, the high Ambiguity Tolerance 20 group's average score was 59.24%. This shows us that students with a low ambiguity tolerance score achieved significantly higher percentage grades than students with a high ambiguity tolerance score. This contradicts the expectation that students with high scores on tolerance of ambiguity tests would score higher on achievement tests.

There is no significant difference when comparing these ambiguity tolerance scores between experimental and control classes. However, there was a tendency for the high Ambiguity Tolerance 20 group to produce better achievement test average scores in the control class compared to the experimental class (61.36% vs 57.75%), as did the high Symbolic Measure of Authoritarianism group (65.35% vs 60.17%). These results contradict the expected findings that high tolerance of ambiguity scores in the experimental groups would correlate with higher achievement test scores. In fact, the experimental classes produced lower achievement test scores than the control class.

The analysis also found a significant positive relationship between conceptual level and average Symbolic Measure of Authoritarianism score

($r[74] = .252$ $p < .05$ $p = .014$). High conceptual level is positively correlated with high Symbolic Measure of Authoritarianism score. This correlation was not significant in the experimental classes, ($r[46] = .225$ $p < .05$ $p = .062$), but it was significant in the control class ($r[46] = .336$ $p < .05$ $p = .040$). This indicates that the control class was more conducive to promoting both conceptual level growth and tolerance of ambiguity than were the experimental classes.

C. Attitude

Attitude was measured by two bipolar scales. The first scale, the Polarity Scale on Teaching, measured student attitude toward the occupation of teaching. The results are presented by class and conceptual level in Table 7. The second scale, the Polarity Scale on Class Structure, measured student attitude in the experimental classes toward the different teaching models they were exposed to.

Analysis of the pre/post score changes on the Polarity Scale on Teaching revealed no significant differences by class or by conceptual level (see Table 7). This does not support expected findings that the experimental classes would produce more positive feedback than the control class. However, there may appear to be a tendency for the low conceptual level group in the control class to view teaching in a less favourable light than the

Table 7

Change in Polarity Scale on Teaching Scores by Class and CL

Class	Change in PST Score September-December		
	Low CL Group	Moderate CL Group	High CL Group
1	0.92	2.25	6.17
2	4.60	2.60	0.82
3	-5.55	2.42	5.40

Note: Range 14-98. $F(4,67) = 2.157$ $p < .05$ $p = .083$.

other groups.

The results from the Polarity Scale on Class Structure show a clear preference by the experimental classes' students for the communication forum model (82% rating) over the group investigation model (68% rating) and the advance organizer model (62% rating).

It was expected that the advance organizer model would be rated the lowest by the experimental group since it most closely resembles the most common form of classroom instruction the students are regularly exposed to.

D. Monitoring

The purpose of the monitor was to verify the delivery of the research strategy. The monitor reported the study's procedures were adhered to for both experimental and control groups. This was expected as I followed the planned research strategy. Please see the appendix for a results statement by Mr. K. Cameron.

Chapter Five Discussion

In this chapter I wish to discuss the meaning and import of the findings reported in the previous chapter. I will summarize the results, discuss reasons for contradictory findings, address both theoretical and practical implications of these findings for the classroom, and present suggestions for further research.

In the introductory chapter I argued that too much single mode instruction occurs in schools, resulting in repetitious, uninteresting schooling and poorer student performance. This study was carried out in an effort to show that the use of a rotation of teaching models, an alternative to single mode instruction, would produce significantly better achievement and attitudinal growth in students. The data gathered and analyzed did not support my position, but neither did it preclude rotating teaching models from being an effective instructional method, particularly if the rotation was employed on a long term basis when student discomfort might not operate as a major inhibiting factor.

Even so, a conclusion I could draw from the previous chapter is that single mode instruction is as good if not better than rotating teaching models. These results may actually reflect and support the view that incorporating

different teaching strategies on a short term is counter productive, creating discomfort and resistance among students. If this is the case, then it could follow that Joyce and Weil's position, that a repertoire of models is particularly important for a teacher, is suspect. This interpretation also questions Hunt's contention regarding the relationship between class structure and conceptual level, for both low and high conceptual level groups produced significantly better academic scores in the more structured, teacher centered environment.

It can be argued then, that it is more important to "do one thing and do it well" than to present a myriad of activities in an attempt to satisfy different learning styles in a classroom. In this scenario, a teacher will build an atmosphere of confidence and comfort in which students can best stretch out and learn. The teacher will pull students toward expectations, while fostering the view that everyone functions best in routine. As creatures of habit, knowing what will happen and how it will happen will lead to greater productivity than will the chaos created by shifting gears and activities on a frequent basis. People get used to a method of instruction, and more individuals will benefit by having the student hone in and focus on the instructor's style and delivery of concepts than by having the instructor attempt to treat all the various learning styles and idiosyncrasies present in a public classroom.

Excellent instruction may be an extension of personality traits, an extension of a teacher's own comfort zone within the structure he or she chooses to advance. If this is so, then in most cases it is not likely one could expect either student or teacher to attain excellence among a variety of teaching strategies. Further, if several strategies are promoted, is education then willing to accept the likely consequence of mediocre instruction spread over this variety?

One can not interpret the results chapter favourably if looking for support for the study's hypothesis and its expected findings, namely that rotating teaching models may best serve students in their development and attainment of life long learning skills. Therefore, in order to demonstrate the benefits of rotating teaching models, a study using a longer rotation interval between teaching strategies is likely necessary. The rotation design in this study was too frequent and I submit this created significant enough levels of discomfort to impede optimal learning. If a rotation involving three strategies took place on a three month cycle, and not a 2 ½ week cycle, then I think the effects of rotating teaching models could be more accurately reflected in results stemming from such a study. Regardless, this study's design produced a number of findings I wish to comment upon and explain.

In a classroom, high percentage course grades, high conceptual

functioning and ambiguity tolerance are desired ends. How are these goals best pursued? The study's results show that high conceptual level score was positively correlated with Symbolic Measure of Authoritarianism (ambiguity tolerance) score, and high conceptual level students produced significantly higher percentage grades in the control class. Also reported was a tendency for students with high Ambiguity Tolerance 20 scores to produce better percentage grades in the control class than the experimental classes. For the confines of this study, these statements suggest that the better method to pursue ambiguity tolerance, high conceptual level and higher academic performance is instruction by one teaching model and not by rotating teaching models. This directly contradicts the hypothesis. However, such a statement must be qualified by statements describing strengths and weaknesses of the study's design and analysis, as well as a discussion of both the theoretical and practical implications of the results for the classroom.

A. Strengths and Weaknesses of the Study

This study's design had positive aspects as well as weak points. A strength of the study is that the three instruments used to measure tolerance for ambiguity demonstrated a good degree of consistency on which summary results could be based. The Ambiguity Tolerance 20 Scale, the Symbolic Measure of Authoritarianism, and the Paragraph Completion Method exhibited

construct validity, meaning they measured what they intended to measure. Further, the raw scores reported here are similar to raw scores reported in studies in the literature. The groups in this study were statistically similar in composition, and were randomly constructed. Another methodological strength is that there was only one instructor for all three classes. This helps to ensure that any differences found between experimental and control groups is more likely the result of class structure and not different teachers. I involved a monitor for procedure, and the scoring of all instruments occurred only after the study's classes disbanded.

A potential weakness of the study may have been including the advance organizer model in the experimental rotation. This design may have restricted the detection of significant differences that may have developed between experimental and control groups. A different high structure approach employed in the experimental classes, or no high structure at all, may have promoted greater environmental difference between the two groups and may have yielded more significantly different results. Secondly, the forced choice examinations used to formulate percentage grades are more conducive to the structure of the control class. Students in the experimental classes genuinely attempting to engage in authentic exchange of ideas while exploring alternative sides to questions would be more likely to find the multiple choice questions

narrow. For them, this could produce lower achievement scores and impact negatively on other measures of a more affective nature. Thirdly, even if I found a large number of significant differences between experimental and control groups, I could not be sure if the cause was the rotation of the teaching models or the differences in class structure level. These two variables require clearer delineation, perhaps by holding one of them constant in a future study.

The hypothesis that rotating teaching models would promote tolerance for ambiguity and academic growth was not supported by the findings at a statistically significant level. Indeed, the results suggested that, at the end of the study, the experimental classes may have been shifting toward less tolerance for ambiguity as the control class was shifting toward greater tolerance for ambiguity. These shifts are not statistically significant, but this divergence requires an explanation.

This trend may have stemmed from the experimental classroom environment's sharpening of an in-group bias which was not present in the control classroom environment. The group investigation model, incorporated into the experimental classes, may have promoted those students to develop a sense of identity with their discussion group, leading them to actions which excluded others. This in-group favouritism could have contributed to fostering a sense of competition and rigidity in the classroom, hence reporting lower

scores on the ambiguity tolerance measures at the conclusion of the study.

From the control class viewpoint, in-group discussion was not present, and so effectively drawing student thought into the public domain through the advance organizer model depends largely on the strength of the teacher. I had eight consecutive exemplary years of evaluation behind me at the time of this study. I may have been able to work a large group situation effectively, and promote desired values and ends using a teaching strategy most familiar to me, in this case the lecture based advance organizer. It is likely that the students in this study were also most familiar with this method of instruction. Therefore, their superior achievement in the control class could be attributed not only to my familiarity but to their familiarity with the teaching model they were exposed to; in essence a reciprocal familiarity with the method at hand. This would be supported by Ausubel (1968), and his discussion regarding facilitation of transfer. Ausubel suggests the advance organizer is the most efficient method to shape the learner's cognitive structure and to make potentially meaningful new ideas actually meaningful. The principal function of the organizer is to bridge the gap between what the learner already knows and what he needs to know so he can successfully learn the task at hand. In principle, deliberate manipulation of relevant attributes of cognitive structure for pedagogic purposes should not meet with undue difficulty (p. 147-148).

This type of manipulation of cognitive structure Ausubel refers to is not precisely exemplified by this study's experimental classes' rotation of teaching strategies. This rotation is, rather, a manipulation of pedagogic process. Regardless, these rotating teaching models may have actually created difficulty and even blockage for these students in their attempts to find meaning within the content being studied. Therefore, the reciprocal familiarity with the advance organizer, employed in the control class over the entire time frame of this study, may have assisted me in pulling and stretching these students' capabilities towards higher percentage grades, conceptual level development, and greater tolerance for ambiguity. Such a situation may have occurred in this study, helping to explain the diverging results of the experimental and control classes.

Further, one may conclude that if I had experience and familiarity with the other two models that was equitable to my experience with the advance organizer, the results produced by this study may have been more definitive. Therefore, it may be suggested that the degree of familiarity with a teaching model, not only to students but to teachers, will likely be reflected in the reported results of student achievement measures.

B. Theoretical Links

Some results of this study are linked to theoretical positions outlined

in the literature review. Hunt's assertion that low conceptual level students learn better in high structure programs did surface in the results. However, the inverse did not. My results suggest high conceptual level students learn better in high structure programs, not low ones. The factors used to define learning better are higher grades and growth in conceptual level and ambiguity tolerance. This, however, must be qualified by the short term nature of this study. Hunt (1977a) states the most preferable method for validating a developmental construct such as conceptual level is through a longitudinal approach. In fact, data from a five year study in Ontario reports conceptual level scores falling the first year before registering growth in the next four years (pp. 53-4). The results from the study reported in this thesis show conceptual level growth occurring in all three classes over a three month period. Conceptual level measured by the Paragraph Completion Method is a very slow growing attribute, and the time limitations of this study may have accounted for the lack of differences between experimental and control classes.

Next, I wish to comment on my observations of the concept of discomfort among experimental group students. Rogers (1961) states that it is natural to perform better in domains in which we already feel safe. This study's rotation of social and personal teaching models created an environment in which some may not have felt safe or comfortable enough to learn, hence

lowering achievement compared to the standard lecture based control class.

Generally speaking, the more complex the social action required by a model...the more initial difficulty students will have with that approach to teaching. Unfamiliarity also increases initial difficulty. For example, students who have never engaged in directing their own learning activities will have considerable difficulty...(Joyce and Weil, 1986, p.462).

It could very well have been, in the short term at least, that such difficulty and discomfort could have lowered students' tolerance for ambiguity because the rotating teaching models upset them. This would help explain my findings that the experimental classes' tolerance for ambiguity decreased as the control class' tolerance for ambiguity increased, the latter being more secure in a comfortable environment.

When students in the experimental classes participated in the group investigation and communication forum models, some of them did exhibit difficulty and discomfort. For example, a student who was experiencing some frustration working in her group, ventured over to another group to check on their progress. She was promptly told by a member of the approached group that she had no business being there. This was stated even before I was about to direct her. Hence, I did not speak to her and she returned to her own group. Similar incidences occurred early in the study in both experimental classes, and appeared to be quickly extinguished within the classroom setting

by the group divisions themselves. As some students became aware of how acquaintances and friends in the control class were not being subjected to group investigation or communication forum models, they questioned why this was the case. Three students, on different occasions, expressed that they felt they were being forced to work harder, work for themselves, that the teacher was being unfair to treat different classes differently, and there was some resentment as a result. I would respond that this was an aspect of the study they were participating in, and reiterated the goals to strive for as a member of a group or dyad, those being to develop a respect for the dignity of all and a commitment to pluralism and to inquiry, to develop independence as a learner, to become better aware of different points of view, to take a constructionist view of knowledge, and to build effective group governance and interpersonal skills. However, as the high school years involve fairly intense peer structures and regulated compliance to attend, these goals will likely always appear remote or unimportant to a particular percentage of enrolment. After all, how much of educational theory takes into account whether or not students want to be in class?

Anderson's 1959 view still appears to hold. "... our schools are essentially authoritarian, and it may take considerable exposure before students become acculturated to learner-centred methods" (Anderson, 1959, p. 207).

So, if discomfort does lead to growth (Thelen, 1960; Hunt, 1971), then we might expect a similarly constructed longitudinal study to chart experimental classes surpassing the control class in achievement. Thus, student discomfort created by rotating teaching models may serve to impede achievement when it is implemented on a short term basis. However, the long term use of rotating teaching models could promote student achievement and attitudinal growth. The study reported in this thesis may not have measured the effect of rotating teaching models per se, but rather student discomfort induced by the change from a traditional model to an alternative style of classroom instruction.

C. Practical Links

There are some practical implications of this study for my day-to-day classroom activities. However, it is important to first state that the complexity and sheer number of interactions between a teacher and pupils makes measurement of educational activities and their effects difficult (Dunkin and Biddle, 1974, p. 58). Statistics are a set of rules for drawing conclusions from numbers, and these statistical conclusions are conclusions about the numbers themselves, not about the people that the numbers represent (Murphy, 1988, p. 52). The tests used in this study do not measure a whole person, only some of their attributes.

As Egan (1988) states: "Doing research on human subjects in complex

settings with the aim of improving something so problematic and value-laden as education presents the researcher with a daunting range of conceptual difficulties" (p. 69). Directly related to my study, Egan points to . . . "the disillusionment of the Aptitude/Treatment/Interaction (ATI) research program stimulated by Cronbach (1957, 1975), leading to Snow's conclusion that, while the search for general theory in such areas is perhaps impossible, we may still hope to establish ATIs with local applicability (1977, p. 76). Egan suggests that, "what seems to remain for empirical research is the establishment of limited and local findings applicable to particular subjects, at particular times, in particular circumstances" (p. 76). I do not claim any more than the above for my study. Therefore, care must be taken when interpreting statistically significant differences, or even reported patterns or tendencies toward statistical difference. Yet, even though some of my conclusions may not fall within rigid statistical rules, they may still be clinically significant and have application to those classroom activities studied.

In today's high school classes, pressures to achieve academically create anxiety in students. Pupils are primarily interested in immediate results, not long term abstract growth that might result from exploring ideas within a rotation of teaching models. This may be why high conceptual level students performed better in the control class than in the experimental classes. This is

supported by Porteus (1976, p. 168) who found that performance among high anxiety-high conceptual level students was better in teacher-centered than in student-centered structure. Generally then, anxiety about grades among students fuels their demands for teacher-structured classes.

From the teacher's perspective, evaluative pressure based on classroom diploma exam averages may deter expansion into new teaching models. Fearing lost time, confusion, or trying something the first time, teachers will more likely stick to the tried, to prefer the known to the unknown, the conservative to the expansive. Discipline today is another reason why teachers may be reluctant to expand their teaching strategy repertoire. Fearing slippage of order or loss of control, even chaos in the classroom, is enough impediment to deter experimenting with new strategies. And in situations of poor attendance by students, sequencing lessons becomes only a wish and many well laid plans can go awry by students saying, "Mr. X, Cecelia is not here today and she was going to lead our discussion...", or "...Rebecca is away and she has the surveys at home..." or "...Bobbie borrowed my graphs and she is not here...", or, if she is here "...she can't find them." Simple and small concerns? On paper perhaps, but within a classroom whose effective governance and teaching strategy relies upon such responsibilities, they can become large obstacles. Therefore, it can be easier

to slide into a single mode instruction and factory like routine in the face of such daily difficulties. And so teacher structured classes remain the overwhelming norm, particularly at the diploma examination course level.

Yet we must also recognize that it may be this structure that creates, more often than not, greater confidence among students that they are "getting it right" and will pass government examinations. Unfortunately, the preparation for the narrow focus of these standardized multiple choice tests may be doing a disservice to students and teachers in as much as they foster either/or and black/white thinking. Relating this to our study, note that students who had lower ambiguity tolerance scores produced significantly better grades than those who had higher scores. However, classrooms have a responsibility not to promote intolerance for ambiguity, but rather ambiguity tolerance and an extensive exploration of alternative positions to foster academic maturity. In general, forced choice examinations undermine this responsibility. Failing to promote ambiguity tolerance in students is failing to help prepare them for their futures.

As Toffler (1990) observes:

With advancing technology spreading, unskilled and poorly educated workers are being squeezed out of their jobs in cutting-edge companies. This leaves behind a more educated group, which cannot be managed in the traditional authoritarian, don't-ask-me-any-questions fashion. In fact,

asking questions, challenging assumptions are becoming part of everyone's job (p. 211).

Polar opposites, or dichotomies that characterize ambiguity intolerance impose a false and sharp polarization on the world and allow no middle ground or spectrum (deBono, 1990, p. 197). Right/wrong, us/them, friend/enemy, capitalist/communist, are opposites that do not necessarily foster tolerant, expansive and mature thinking.

Glasser (1969) offers support when he states:

Education does not emphasize thinking and is so memory-oriented because almost all schools and colleges are dominated by the certainty principle. According to the certainty principle, there is a right and a wrong answer to every question; the function of education is then to ensure that each student knows the right answers to a series of questions that educators have decided are important...In addition to the certainty principle, education, like much of our society, is dominated by the measurement principle. The measurement principle can be defined as nothing is really worthwhile unless it can be measured and assigned a numerical value.
(p. 36-38)

Glasser argues that these two principles are important causes of educational failure, citing boredom and frustration among students as effects. The goals should not be to restrict thought but rather

...the goals of education are to give people the mental tools to deal effectively with new situations, to place fewer restrictions on their lives caused by fear of difficult problems, and to

enable people to deal with new situations and difficult problems rationally... (p. 43)

It is from this perspective that my study stressed the importance of tolerance for ambiguity and the desire to find support for a method of using teaching models that could foster such goals that Glasser describes.

Alberta Education (1987) outlines concepts and skills considered essential for lifelong learning. Among these are (a) the recognition "...that flexibility and adaptability are important attributes in a changing world," (b) students will develop the ability to "...plan for the future, cope with ambiguity and uncertainty"...(c) "examine and assess a variety of view points on controversial issues before forming an opinion," and (d) students "...must learn to tolerate and manage uncertainty, change and ambiguity" (pp. 5, 12). These skills are important for both classroom and society because intolerance for ambiguity can lead to pre-judgments, and not possessing the efficacy to consider new information or new situations is detrimental to a person in today's rapidly changing social environment. If this is the case, then why do government diploma examinations, which may not foster these skills and concepts, continue to be employed?

This study attempted to find a classroom teaching approach that could best promote such concepts and skills. The findings did not definitively

support either rotating teaching models or single mode instruction as being more effective in this task. Even so, a great deal of personal insight was gained from this study. Regardless of the statistical support or non support for the hypothesis, I found rotating teaching models to be a rewarding professional experience. Investigating conceptual level development and its links to ambiguity tolerance has expanded my understanding of individual differences in students in my daily classes. This study demonstrated to me the clinical value and necessity of developing an expansive teaching model repertoire if one truly wants to assist student development.

D. Further Investigation

A similar study in the future would require a longitudinal approach and better control over extraneous variables. It would be advantageous to structure each student's entire course schedule for the purposes of such a project. This would result in a better investigation, with more control over teaching models the students would be exposed to.

A future study might explore the interaction between learning partners and conceptual level within the communication forum model. If growth can occur in an environment where meaningful experience takes place, then the communication forum model merits closer attention. Experimental student scores on the Polarity Scale on Class Structure show a clear preference for the

communication forum structure, possibly because from a social viewpoint it compromises group pressure and high structure isolation, presenting a more comfortable learning environment. Within the communication forum model, learning partners might be paired by opposite conceptual level and grade difference. This would create discomfort for both, as long as the differences were not too great. Keeping grade differences to approximately 20% between a low and high conceptual level pair may be a guideline. The study could then compare the progress of such pairings to another class structure regarding academic achievement, conceptual level growth, and ambiguity tolerance. Such a project could be run in the form of action research by an interested teacher or small group of teachers.

It can be through better understanding of the many dynamics at work in a classroom that teachers can assist student advancement. This study documented some of these dynamics and attempted to show that rotating teaching models is a more beneficial method of teaching than instruction by a single model. Although not statistically demonstrating this, these findings do not preclude rotating teaching models from being an effective instructional method, particularly when employed on a long term basis, when student discomfort may not operate as an inhibiting factor.

Appendix

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Student Comments

4

"Why is it, that when we are younger we enjoy school, we enjoy getting up and its a thrill to go. But as time wears on school becomes tedious and boring?"

5

"It is a system that does not get the child, or teachers, motivated to learn and teach. All sides are bored, so this leads to a breakdown in communication, which can destroy an education."

6

"The tired and unlearning students sit at their desks while a teacher that has useless facts stands in front and talks and talks."

7

"How can teachers expect their students to enjoy what they're learning when they don't seem to enjoy what they're teaching? We need more teachers with a positive outlook and new, ever changing teaching skills."

8

"Let's call the first teacher Mrs. A., a teacher who always had to have things done exactly the way she wanted them, day after day. She never accepted a variation of what she told the class to do even when the variation was in fact much better than her initial instructions. This very narrow minded teacher taught the same way every day, and even argued with me as to how my address is spelled and later told me to spell it her way which was in fact incorrect."

Ambiguity Tolerance 20 Scale

Please do not spend too much time on the following items. There are no right or wrong answers and therefore your first response is important. Mark **T** for true and **F** for false. Be sure to answer every question.

1. A problem has little attraction for me if I don't think it has a solution.
2. I am just a little uncomfortable with people unless I feel that I can understand their behaviour.
3. There's a right way and a wrong way to do almost everything.
4. I would rather bet 1 to 6 on a long shot than 3 to 1 on a probable winner.
5. The way to understand complex problems is to be concerned with their larger aspects instead of breaking them into smaller pieces.
6. I get pretty anxious when I'm in a social situation over which I have no control.
7. Practically every problem has a solution.
8. It bothers me when I am unable to follow another person's train of thought.
9. I have always felt that there is a clear difference between right and wrong.
10. It bothers me when I don't know how other people react to me.
11. Nothing gets accomplished in this world unless you stick to some basic rules.
12. If I were a doctor, I would prefer the uncertainties of a psychiatrist to the clear and definite work of someone like a surgeon or X-ray specialist.
13. Vague and impressionistic pictures really have little appeal for me.
14. If I were a scientist, it would bother me that my work would never be completed (because science will always make new discoveries).
15. Before an examination, I feel much less anxious if I know how many questions there will be.

Ambiguity Tolerance 20 Scale continued

16. The best part of working a jigsaw puzzle is putting in that last piece.
17. Sometimes I rather enjoy going against the rules and doing things I'm not supposed to do.
18. I don't like to work on a problem unless there is a possibility of coming out with a clear-cut and unambiguous answer.
19. I like to fool around with new ideas, even if they turn out later to be a total waste of time.
20. Perfect balance is the essence of all good composition.

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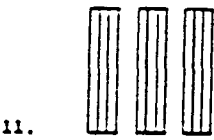
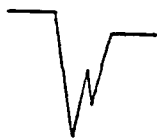
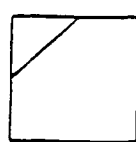
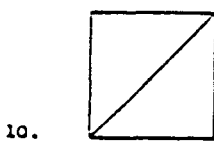
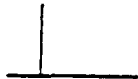
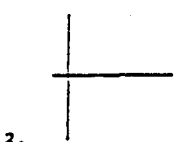
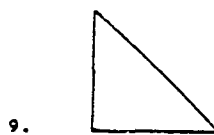
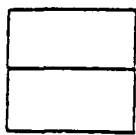
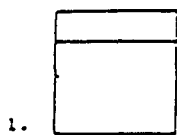
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Symbolic Measure of Authoritarianism

Below are 15 pairs of line drawings and number arrangements. Look at each pair and then draw a large check mark through the ONE drawing or number arrangement in EACH PAIR that you like best.

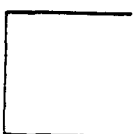


13.
 30-40
 20-30
 5-10
 10-20

5-10
 10-20
 20-30
 30-40

6.
 1
 2
 3
 4

1 2 3 4



8. 1-2-3-4-5

4-1-2-5-3

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Paragraph Completion Method

"On the following pages you will be asked to give your ideas about several topics. Try to write at least three sentences on each topic.

There are no right or wrong answers, so give your own ideas and opinions about each topic. Indicate the way you really feel about each topic, not the way others feel or the way you think you should feel. You will have about three minutes for each page."

The topics, each on a separate page, are:

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Paragraph Completion Method continued

1. What I think about rules...

Paragraph Completion Method continued

2. When I am criticized...

Paragraph Completion Method continued

3. What I think about parents...

Paragraph Completion Method continued

4. When someone does not agree with me...

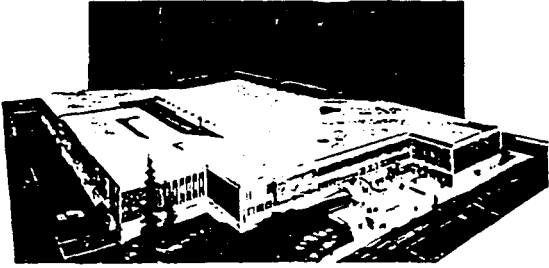
Paragraph Completion Method continued

5. When I am not sure...

Paragraph Completion Method continued

6. When I am told what to do...

Monitor's Statement



TELEPHONE 252-7341

BISHOP GRANDIN HIGH SCHOOL
111 HADDON ROAD S.W., CALGARY, ALBERTA T2V 2Y2

February, 1990

To Whom It May Concern:

This letter is being written to verify my role as a monitor of "class structures" within the action research project administered by David Burns at Bishop Grandin School, Calgary, from September 1989 to December 1989. Over the project's duration, I observed the successful and distinct operation of each of the low structure, moderate structure and high structure classes.

Throughout my visits I noted distinct differences in the style and amount of teacher/student interaction. My observations in the low structure visits were consistent with each other, as were my observations in the moderate and high structure classes.

To my knowledge, David Burns administered the three separate class structures distinctly and consistently throughout the project's course.

Sincerely yours,

Kevin Cameron
Department Head
Religious Studies

Principal's Statement



TELEPHONE 252-7541

BISHOP GRANDIN HIGH SCHOOL
111 HADDON ROAD S.W., CALGARY, ALBERTA T2V 2Y2

February, 1990

To Whom It May Concern:

David Burns is a teacher of Social Studies at this school. As principal and guarantor, I assisted David in his university research project in the following manner:

- (1) On September 8, 1989, I sign sealed twelve (12) sets of instruments he administered to his subjects September 8, 1989.
- (2) On December 21, 1989, I sign sealed fourteen (14) sets of instruments he administered to his subjects December 21, 1989.
- (3) On January 29, 1990, after Mr. Burns' final grades for Fall Semester 1989 were submitted to my office, I verified that all twenty six (26) envelopes containing the project's instruments were still sign sealed.

I trust this will meet with your satisfaction.

Yours sincerely,

C. F. MacIsaac
Principal

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