

**A Neo-Piagetian Perspective on Student Teachers'
Representations of the Real Life Teaching Problem:
Adapting Instruction to Individual Differences
Among Learners**

by

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ABSTRACT

This study was an exploratory study of how student teachers represent the real life teaching problem of adapting their instruction to individual differences among learners and how their representation changes over the course of the practicum experience. The extent to which Cases' (1985, 1991) neo-Piagetian conceptual framework may describe the development of these student teachers' ability to represent this real life teaching problem was also examined.

The non-random sample consisted of 39 intermediate level student teachers who completed three sets of questionnaires prior to and during the fourth and ninth weeks of the practicum experience. Twelve faculty supervisors also completed rating forms and observations on the student teachers they supervised during the same weeks.

Student teachers' responses to two questions regarding aspects of individual differences problematic for teaching prior to and during the practicum experience were rated according to the levels of problem representation derived from Case's neo-Piagetian theory

of intellectual development. Faculty supervisors' rating forms and observations provided a means of assessing whether student teachers translated their representations into action. An additional variable of interest to the study included the nature of the individual differences noted by student teachers.

The results suggested that student teachers' level of problem representation and description of the problem increased in complexity over the course of the practicum experience. Also, that Case's neo-Piagetian conceptual framework may provide a useful theoretical tool for describing the development of student teachers' ability to represent the individual differences teaching problem.

Implications for teacher education and studies of teacher thinking were discussed. The need for clinical interviews augmented by classroom observations made by supervisors trained in a neo-Piagetian developmental perspective was emphasized for future studies. Several research questions, related to the use and further development of Case's neo-Piagetian conceptual framework in the domain of teaching, were generated.

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To my Dad,
Walmis Newman Jr.
(1925-1991)

CHAPTER 1: INTRODUCTION

This study is an attempt to describe the ways in which student teachers represent real life teaching problems and the ways in which their representations change over the course of the practicum experience.

Real life teaching problems include those ill-structured problems that are complex, uncertain, and laden with dilemmas because they involve on-the-spot decisions about "what students know, what effects teaching has had and will have, what content they should be trying to teach, what instructional authority they have, and how they can improve their teaching" (Floden & Clark, 1988 p.506).

Ill-structured problems refer to situations where the individual finds himself faced with a problem for which there is no immediate or known solution. Kitchener (1983) describes the nature of an ill-structured problem:

There is not a single, unequivocal solution which can be effectively determined at the present moment by employing a particular decision-making procedure...Evidence, expert opinion, reason, and argument can be brought to bear on the issues, but no effective procedure is available which can give a correct or absolute solution. A solution must be constructed by integrating or synthesizing diverse data and opinion. (pp.224-225)

The problem the student teacher faces in adapting instruction to individual differences among learners in the following example is ill-structured in that the student teacher must juggle the cognitive, affective and motivational needs of a sub-group of students with the needs of a larger group while taking into account the range of individual ability within both groups and the resources (space, time, materials) available as well as the wider context of parent, supervising teacher, principal, and school board expectations.

Differences in reading ability, mainly due to ESL problems poses a difficult problem. This has been especially problematic in math, where lack of reading ability severely hampers the student's ability to solve problems. To adapt to this, I have been using simpler problems for the ESL student that required the same strategy as those being solved by the non-ESL students (See Appendix A, 7a, See Table 4.1, Subject #001).

Clark and Lampert (1986) characterize the complexity of the teacher's task:

The teacher encounters a host of interrelated and competing decision situations both while planning and during teaching. There are no perfect or optimal solutions to these decisions. A gain for one student or in one subject matter may mean a foregone opportunity for others. A motivationally and intellectually profitable digression may reduce time devoted to mandated curriculum. Such conflicts among teachers' multiple commitments lead to practical dilemmas which

must be managed in interaction with students.
(p.28)

Indeed, the ability of the professional to integrate experience with theory and research in the formulation of on-the-spot solutions to unique, complex problems of the day to day task of teaching is what Schon (1983, 1987, 1991) termed "reflective practice". The development of a complex representation of and a reflective stance toward real life teaching problems is the challenge all student teachers are faced with as they begin their journey toward expertise.

It will be argued in this study that in order to examine how student teachers begin to think about the complexity and conflict inherent in real life teaching problems, researchers need to explore how the student teacher represents the problem of teaching and how that representation develops over the course of experience.

The purposes of this study were:

(1) To investigate the ways in which student teachers represent the problem of adapting instruction to individual differences among learners.

(2) To investigate the ways in which their representation of this problem changes over the course of the practicum experience.

(3) To investigate whether or not the structure and

processes of Case's (1985, 1987, 1991) neo-Piagetian perspective provide an adequate theoretical means to describe the development of student teachers' ability to represent real life teaching problems.

A. BACKGROUND TO THE PROBLEM:

American surveys have found that Teacher Education programs focus their preparation of student teachers largely upon curriculum content, methods and lesson plan preparation with little attention given to the development of flexibility and problem solving skills deemed necessary to deal with real life teaching problems (Emundson, 1990; Goodlad, 1990a). Much has been written about teacher's thought processes when they confront a problem yet these accounts are often either too specific and superficial or too global and, therefore, lacking in sufficient detail to be useful to teacher educators and supervising teachers who wish to foster the development of flexibility and reflection in student teachers (Howey & Zimpher, 1989; Goodlad, 1990b).

A neo-Piagetian perspective may provide the theoretical tools of structure and processes necessary to analyze the nature of student teachers' representation of real life problems and to model the development of that ability over the course of experience.

B. STATEMENT OF THE PROBLEM:

How do student teachers represent the real life teaching problem of adapting their instruction to the individual differences among learners?

How do student teachers' representations of real life teaching problems change over the course of their practicum experience?

Are the structure and processes of Case's (1985,1987,1991) neo-Piagetian perspective useful theoretical tools to address the development of student teachers' abilities to represent real life teaching problems?

In order to examine these questions, student teachers participating in a thirteen week practicum were asked prior to their practicum experience what their definition of individual differences among pupils was and which aspects of individual differences would likely have the most impact on the way that they would teach during the practicum. They were also asked what aspects of individual differences they thought were likely to be problematic for teaching and why. During the fourth and ninth weeks of their practicum the student teachers were

asked to describe the most difficult problem they had adapting their teaching to individual differences among students. Similarly, student teacher faculty supervisors were asked how student teachers accommodated individual differences among learners during the first and second halves of the practicum. The faculty supervisors were also asked to rank the student teachers on a seven point Likert scale designed to indicate how well the student teachers were able to accommodate individual differences among learners during the two periods outlined.

It was expected that:

(1) Student teachers who have a more complex representation of the problem of adapting their instruction to individual differences among learners will propose solutions that are more flexible in their accommodation of individual student differences.

(2) Student teachers' representation of the problem will become more complex over the course of the practicum experience as would be predicted by Case's neo-Piagetian theory of intellectual development.

(3) The structure and processes of Case's neo-Piagetian theoretical perspective will provide an adequate theoretical framework from which to conceptualize the development of a student teacher's ability to represent the problem of adapting their instruction to the individual differences among learners.

C. SIGNIFICANCE OF THE STUDY:

The educational importance of this study is focused

in its potential to provide a means for understanding how student teachers represent real life teaching problems, in particular, the problem of adapting their instruction to the individual differences among learners and how this ability develops during the practicum experience. It is hoped that this study will provide a useful theoretical framework to guide further inquiry and a developmental perspective on how student teachers represent real life teaching problems and ultimately develop the flexibility and reflective skills necessary to meet the challenges of these teaching problems more effectively. A developmental perspective on how student teachers represent real life teaching problems and how that representation changes over the course of their experience is particularly relevant to the study of student teachers, their teaching, and the development of teacher education programs.

D. DEFINITION OF THE TERMS

This is an exploratory study of the ways in which student teachers represent real life teaching problems and the ways in which their representations change over the course of the practicum experience. Several terms

are important for this study. They are defined below:

1. Representation refers to how student teachers think about the real life teaching problems which confront them. In particular, what is known and the way in which that knowledge is organized or structured comprises a view of representation that is a departure from the more traditional and familiar usage of representation as the use of symbols (x stands for y in the external world) (Mandler, 1983). The student teacher's internal schema or frames of reference are used in his interaction with the external world, in this context, the classroom.
2. Real life teaching problems refer to those complex, uncertain, ill-structured problems encountered in everyday teaching which require the student teacher to make on-the-spot decisions which balance learner knowledge, ability, understanding, and motivation, task demands, instructional effect--past, present, and future, available resources, and wider expectations of parents, sponsor teacher, faculty supervisor, principal and school board.
3. Developmental perspective refers to a perspective on growth or change which charts the unfolding story of increments in structural organization. Specifically, cognitive development refers to the intercoordination of abilities at many ages. In Case's (1985, 1991) neo-Piagetian theory of intellectual development, the conceptual framework adopted in the present study, objects, actions, behaviors, and mental events are consolidated, coordinated, and integrated in a process of hierarchical integration. This integration results in operations of a higher level of abstraction in many domains or specific skill areas, that is, ie. spatial, motor, social, emotional, logical-mathematical.
4. Constructivist perspective refers to learners' active construction of their own understandings rather than passive copying of the understandings of others. The construction of new understandings is stimulated when a situation is encountered that challenges the individual's current organization of knowledge.

5. Structures of development refer to the objects, actions, behaviors, or mental events which are coordinated or hierarchically integrated in the sequence of development. In Case's (1985, 1991) neo-Piagetian theory, the structure is a tripartite control structure which consists of three components: (1) a representation of the current problem situation, (2) a representation of the desired objective, and (3) a representation of the strategy--a sequence for going from the current problem situation to the desired situation as efficiently as possible. These control structures are independently assembled for each specific domain of interest or experience. As the person grows older, the complexity of the problem situation, objective, and strategy increases but the basic control structures remain the same.
6. Processes of development refer to the operations which occur to move student teachers from one developmental level (stage or substage) to the next. In particular, Case (1985, 1991) has specified four information processes: schematic search, evaluation, retagging and consolidation which activate two schemas (objects, actions, behaviors, or mental events) either at the same time or in succession.
7. Mechanisms of development differ from processes in that mechanisms set the limit on the number of objects, actions or mental events that can be hierarchically integrated. For Case (1985; 1991), attentional capacity or short term storage space which increases with age provides the means for movement within a stage. The person's growing ability to chunk more information together allows for increased operational efficiency. This operational efficiency is in turn dependent upon both maturational factors and, at the upper reaches of development, upon instruction and amount of practice.
8. Individual differences among learners refers to the characteristics or qualities such as learning rate, ability, prior knowledge, specific interests, motivation level, attentional capacity, maturity

level, ethnic background, learning styles, activity level, social skills, personality, self-esteem, etc. which make one learner unique or different from another learner. In order to take individual differences among learners into account when planning or adapting instruction in the classroom, the student teacher must direct their instruction to the unique and specific needs of the learner. Student teachers in the present study defined individual differences among learners as: "variations in pupils' cognitive, psychomotor, and affective abilities. As each child is unique, individual differences will always exist within any given classroom" (Subject #001).

"Individual differences are what makes a classroom whole" (Subject #133). "Every student learns in a different way depending on their particular set of circumstances and life background. They fit new knowledge into their existing knowledge depending on their past experiences and what they relate the new knowledge to" (Subject #115).

E. SUMMARY OF THE PROBLEM

This study is an attempt to explore the ways in which student teachers represent the real life teaching problem of adapting their instruction to individual differences among learners and the way in which their representations change over the course of the practicum experience. The student teacher's representation is thought to be informed by a cognitive-developmental neo-Piagetian framework. This framework may provide an insight into how student teachers represent real life teaching problems and ultimately develop the flexibility and reflective skills necessary to meet the challenges of

these teaching problems more effectively.

Chapter Two contains a review of the literature pertaining to these research questions.

CHAPTER II: LITERATURE REVIEW

The present study was designed to explore (a) the ways in which student teachers represent real life teaching problems and (b) the ways in which their representations change over the course of the practicum experience.

The present study draws heavily on the literature of three research areas (teachers' knowledge and thought processes, the notions of reflective practice, and Case's neo-Piagetian conceptual framework) to address the enduring and often complex problem of how to prepare prospective teachers to deal with the complexities of real-life teaching problems. It represents a unique combination of these research areas by redefining classroom problems as multi-faceted, ill-defined problems and the student teacher's task of teaching as one fraught with uncertainties. To understand how student teachers think about the ill-defined and uncertain nature of real life teaching problems, research studies related to teachers' thought processes, and reflective practice are introduced. Finally, Case's neo-Piagetian theory of intellectual development is introduced as a means to

frame an investigation into how student teachers think about the complex nature of real life teaching problems and how their thinking develops.

A. THE ENDURING PROBLEM OF TEACHER PREPARATION FOR REAL LIFE TEACHING PROBLEMS

The enduring problem facing teacher education is how to prepare prospective teachers for the uncertainties of the classroom. This dilemma is manifested in the theory/practice dichotomy that powers the debate which occurs in educational circles when educators are faced with the task of developing teacher preparation programs that cannot wait until all the data are in on what constitutes the most enlightened way to educate prospective teachers (See Rowell, Pope, & Sherman, 1992 for a comprehensive review). The theory/ practice dichotomy refers to the attempt to set theory and practice up in opposition to one another as exemplified by remarks such as "all right in theory but it won't work in practice." Such a statement suggests that something must have been wrong with the theory that said it would work. The theory/practice dichotomy is maintained especially in the minds of teachers precisely because so much of educational

theory has been poor (Barrow, 1990). This dichotomy is reflected in views of teaching which range from a generic set of technical skills or pre-specified responses to be supplied at decision points (Gliessman, Pugh, Brown, Archer, & Snyder, 1989; Gliessman, Pugh, Dowden, & Hutchins, 1988; Leinhardt and Greeno, 1986) to teaching as artistry in which the "epistemology of practice is implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict" (Schon, 1983, p.49) The nature of the theory/ practice dichotomy is invariably reinforced by student teachers' experiences in our teacher education programs. When asked to reflect on their teacher training, first year teachers invariably point to the practicum experience as the single most important factor in their preparation to teach (Calderhead, 1988; Doyle, 1990; Sirotnik, 1990) yet, Feiman-Nemser & Buchmann (1985) point to the pitfalls of teacher classroom preparation that await programs that place too heavy an emphasis on the value of the practicum experience. Prospective teachers' previous experience as students, little connection between field experiences and educational theory courses, and the fact that classrooms

are not designed as laboratories for learning to teach are pitfalls because they "arrest thought or mislead prospective teachers into believing that central aspects of teaching have been mastered and understood" (Feiman-Nemser & Buchmann, 1985, p.63). Indeed, evaluations of teacher education programs in the United States point to the fact that a generic collection of teaching skills that offer "quick instructional fixes" will not suffice (Goodlad, 1990a, 1990b; Goodlad, Soder, & Sirotnik, 1990; Howey & Zimpher, 1989; Kennedy, 1991; Sirotnik, 1990). Goodlad (1990b) explains:

The problem is not that generic principles of teaching are irrelevant. The problem lies in overlooking the layers of complexity involved in teaching young people. (p.700)

A host of teaching strategies and methodologies have grown up in the attempt to fill the theory/ practice gap. Micro-teaching (Simbo, 1989), teaching laboratories, (Kowalski, Glover, & Krug, 1988) and case methodology (Shulman, 1992) provide theory which is grounded in the practical context of teaching, yet they lack an underlying conceptual framework, and they view the student teacher as a passive rather than active constructor of his or her own teaching experiences.

Reflective techniques such as reflective writing, autobiography and ethnography, questioning and dialogue, inquiry activities, and faculty modelling (Adler, 1991; Ross, 1987) and the program approaches to reflective practice such as Practice Centered Inquiry (PCI), (Sanders & McCutcheon, 1986) and Reflective Inquiry Teacher Education (RITE) (Freiberg & Waxman, 1987) allow the student teacher a voice in the process of becoming a teacher, but they have yet to be grounded in a cohesive conceptual framework. Barrow (1990) asserts that:

The only antidote to poor theory is good theory. Either we accept the challenge and seek out a stronger theoretical base, or else by definition, we act intuitively or in response to external command. (p.309)

The developmental perspective which guides the Developmental Teacher Education program (Amarel, 1989; Ammon & Hutcheson, 1989; Black, 1989) developed by Black and Ammon at Berkeley views the student teacher as an active constructor of his or her developing pedagogical conceptions. At present, the underlying conceptual framework is loosely described as a "structural-developmental coherent perspective" (Black, 1989, p.2) rather than a developmental theory which includes the major factors which contribute to development yet is only

somewhat theoretically grounded as it pushes the Piagetian notion of general stages to the background in favor of the domain-specific knowledge of pedagogy associated with teaching. The loose nature of DTE conceptual framework results in a program that focuses primarily on how to construct domain-specific pedagogical conceptions in student teachers. The cost of such a focus is the missed opportunity to understand what that development looks like (structures) and why and how it unfolds (processes or mechanisms of development).

A well articulated conceptual framework is needed if we are to educate student teachers substantively rather than just train them technically (Edmundson, 1990; Goodlad, 1990b; Goodman, 1989; Kennedy, 1991; Richardson, 1990; Shulman, 1986, 1992; Sirotnik, 1990; Wildman & Niles, 1987). A means of assessing how student teachers think about real-life classroom problems that is grounded in a developmental conceptual framework which views the student teacher as the active constructor of their experiences will go a long way in meeting Feiman-Nemser and Buchmann's (1987) criteria of what makes student teaching teacher education:

Student teaching is teacher education when
intending teachers are moved toward a

practical understanding of the central tasks of teaching; when their dispositions and skills to extend and probe student learning are strengthened; when they learn to question what they see, believe and do; when they see the limits of justifying their decisions and actions in terms of "neat ideas" or classroom control and when they see experience as a beginning rather than a culminating point in their learning. (p.272)

Not only is a conceptual framework needed to rationalize teacher education programs, but it is also required if student teachers are to begin to develop adequate representations of real life teaching problems. The few studies of student teachers' representation of classroom problems that exist are at best descriptive or impressionistic. No adequate studies exist on how student teachers represent real life teaching problems, let alone how those representations change during the practicum experience.

This investigation into the enduring problem of how to prepare prospective teachers for the uncertainties of the classroom contributes in part to the present study's focus on student teachers' representations of real life teaching problems. It also provides support for the necessity of an inquiry method based on a conceptual framework. The literature to be reviewed in the

following sections - research on teachers' thought processes and research on reflective practice - will help to frame more adequately the research questions of the present study.

B. IMPLICATIONS FOR TEACHER EDUCATION OF RESEARCH ON TEACHERS' THOUGHT PROCESSES

Research on teachers' knowledge and thought processes has proceeded along the lines of description in an attempt to chip away at the task of describing what appears to be a complex, cognitively demanding, human act. Shulman (1986) has established that there are at least three important sources of knowledge required for the competent performance of teaching: content knowledge, pedagogical content knowledge, and pedagogical knowledge. Content knowledge refers to teachers' understanding of the organization, concepts, and relationships among concepts of subject areas such as English or physics. Pedagogical content knowledge is teachers' ability to transform content knowledge into forms that can be learned by ordinary students. It may take the form of analogies, applications to everyday life, concrete

examples, and forms of practice which teachers use to promote student learning. Pedagogical knowledge differs from pedagogical content knowledge in that it consists primarily of a wider knowledge about organization of classrooms, classroom management, evaluation, motivational methods, communicative skills, and personal knowledge of the needs of individual students.

The description of these sources of knowledge goes beyond the view of teaching as a collection of generic skills. The sources of knowledge required in the task of teaching are not only equivalent to the complexity afforded other professions' pedagogical expertise such as medicine and engineering, but are also firmly embedded in the context of teaching (Berliner, 1989; 1991; Carter, Sabers, Cushing, Dinnegar, and Berliner, 1987; Chi, Glaser, & Farr, 1988; Elstein, Shulman, & Sprafka, 1990; Sanders & McCutcheon, 1986). Research on the sources of teachers' knowledge, however, not only requires further description but also needs to focus on the relationships among teacher knowledge, teachers' interactive thinking and what actually happens in the classroom within the social and practical context in which it occurs. Although the present study does not specifically describe

student teachers' sources of knowledge, it does attempt to chart the development of those sources of knowledge in student teachers as they think about the real life problem of adapting instruction to individual differences among learners.

Similarly, research on teachers' thought processes has focused primarily on descriptions of the planning behaviours and interactive thoughts and decisions of experienced teachers. Progress has been made in the description of teachers' planning behaviours, the thinking they do while interacting with students in the classroom and the models which have been constructed to diagram these processes, yet this research focuses on relatively discrete, isolated aspects of teachers' thoughts and actions (Calderhead, 1988).

The narrow focus of research surrounding the identification, frequency counts, and antecedents of teachers' interactive thoughts, and description of teachers' alternative courses of action has told us little about how teachers actually make interactive decisions (Clark & Peterson, 1986) or about how they begin to construct and reconstruct more and more adequate pedagogical knowledge. Pedagogical knowledge is

essential to any representation of real life teaching problems. It is an assumption in this study that changes in pedagogical knowledge will be accomplished by changes in the problem representation of student teachers.

At the other end of the spectrum, the accounts of teacher development which have been inferred from schema theory and comparative studies of the cognitions underlying novice and expert teachers' performances (Berliner, 1986; Sabers, Cushing, & Berliner, 1991; Swanson, O'Connor & Cooney, 1990) are too global to be useful. The general models (Berliner, 1988; Fuller & Brown, 1975; Kagan, 1992) produced by these research efforts give snapshots of teachers' cognitions at very loosely defined 'stages' of 'development' with no attention to the specification of actual processes that move the teacher from one stage to the next.

What is needed is research which: (1) uses "longitudinal designs and cognitive developmental framework instead of continuing to accumulate descriptions" (Clark & Peterson, 1986, p.268) (2) emphasizes teachers' active construction of knowledge rather than the passive description of their thought processes from an information-processing approach

(Calderhead, 1988; Cochran-Smith & Lytle, 1990; Elbaz, 1988; Peterson, Clark, & Dickson, 1990). The present study adopts a developmental, constructivist approach to student teachers' representations of real life teaching problems over the course of the practicum experience in the attempt to understand the development of student teachers' organizing structures and to test the adequacy of Case's (1985, 1991) neo-Piagetian theory of intellectual development as a theoretical tool and conceptual framework.

C. IMPLICATIONS FOR TEACHER EDUCATION OF RESEARCH ON REFLECTIVE PRACTICE

The notions of reflective practice that are prevalent in the research literature seem to be as numerous as the practitioners which use them. The terms "reflective practice", "reflective teaching", "reflection-in-action", "action oriented research", "inquiry oriented research", "reflective practitioner", "teacher as researcher", and "teacher as problem solver" all encompass a notion of reflection in the process of professional development which involves a way of thinking

about education that places value on making choices and taking responsibility for those choices (Adler, 1991; Calderhead, 1989; Goodman, 1984; Liston & Zeichner, 1990; Ross, 1989a; Zeichner & Liston, 1987). Such notions of reflection populate a wide spectrum of variation, yet most begin with the issues and concerns of the teacher as learner, honour the complexity of the teacher's own way of knowing and view the teacher as a 'constructor' of knowledge involved in a process of development toward expertise. Ross (1989) aptly summarizes some of the elements of the reflective process:

Recognizing an educational dilemma. Responding to a dilemma by recognizing both the similarities to other situations and the unique qualities of the particular situation. Framing and reframing the dilemma. Experimenting with the dilemma to discover the consequences and implications of various solutions. Examining the intended and unintended consequences of an implemented solution and evaluating the solution by determining whether the consequences are desirable or not. (p.22)

Much of the writing on reflective practice evolves from the concepts offered by a few key theorists: John Dewey (1933), Donald Schon (1983, 1987), Kenneth Zeichner, (1981) and the Frankfurt School of Social Research in the

work of Habermas (1974). Various interpretations of these concepts are manifested in the reflective practice programs of Cruickshank (1987), Zeichner and Liston, (1987) and the reflective strategies of Adler and Goodman, (1986), Korthagen (1985), Gitlin and Teitlebaum (1983), Grumet (1989), Hill (1986), Lucas (1988), and Symth (1989) and they drive the design of teacher education programs.

Dewey's (1933) concept of "reflection" defined as:

active, persistent and careful consideration
of any belief or supposed form of knowledge in
the light of the grounds that support it and
the further conclusions to which it tends
(p.9)

emphasized a sense of wonder or unrest at the problem, and a purposeful, reasoned search for the solution. Dewey suggested that the development of reflection involved the growth of certain attitudes (for example, openmindedness) and the acquisition of certain skills (for example, reasoning).

In many ways, Schon (1983, 1987, 1991) echoed Dewey's concept of reflection in his concepts of "knowledge-in action", "tacit knowledge", "knowing in action" and "reflection in action" which place the teacher at the centre of knowledge about the artistry of

teaching rather than the researcher. Schon defines the reflective practitioner as the professional who integrates experience with theory and research in the formulation of solutions which are a response to the uncertainty and complexity of the unique problems of practice. He argues against the view of professional as applied scientist who implements the theories of science in practical situations. He rejects the view of teaching as merely a craft that can be mastered solely through propositional knowledge or passive observation and embraces the teacher as a professional who brings practical competence to bear in divergent situations and searches for "an epistemology of practice implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict" (Schon, 1983, p.49). Schon is more interested in the professional involved in the process of decision-making in which interactive, interpretative skills are brought into play in the analysis and solution of complex problems rather than the decisions themselves as his concept of "reflection-in-action" suggests:

Reflection-in-action is a reflective conversation with the materials of a

situation. Each person carries out his own evolving role... 'listens' to the surprises that result from earlier moves, and responds through on-line production of new moves that give new meanings and directions to the development of the artifact. (Schon, 1987, p.31)

Crucial to Schon's process of "reflection-in-action" are the notions of "problem setting" and problem solving in which the practitioner must notice the problematic and articulate its nature and context.

In real world practice, problems do not present themselves to the practitioner as givens. They must be constructed from the materials or problematic situations that are puzzling, troubling and uncertain. When we set the problem, we select what we will treat as the "things" of the situation, we set the boundaries of our attention to it, and we impose upon it a coherence which allows us to say what is wrong and in what directions the situation needs to be changed. Problem setting is a process in which, interactively, we name the things to which we will attend, and frame the context in which we will attend to them (Schon, 1983, p.40).

For the teacher involved in the process of "reflection-in-action" in which he sets a problem in a situation, Schon (1983) posits "fundamental principles" that are "closely connected both to his frames and to his repertoire of exemplars" (p.317). By fundamental principles Schon means theory or conceptual apparatus in

use. In a "reflective conversation" with the practice situation, past experiences of the teacher are brought to bear on the situation, frames are imposed and call attention to certain aspects of the problem, problems are set and actions that entail certain solutions are formulated. How the teacher sees the situation depends on his or her knowledge base, past experience, the uniqueness of the situation and the people involved, social and professional norms of behaviour and the expectations of others, not to mention the individual way in which his or her reflection unfolds. Schon's conception of problem setting is particularly useful in examining how student teachers represent the uncertainties of real life teaching problems.

Kenneth Zeichner's (1981; Zeichner & Liston, 1987) "critical inquiry" offers another perspective on reflective practice. Zeichner goes beyond teaching as technique and the emphasis on specific situations of practice to a level of inquiry that involves questioning what is generally taken for granted. He posits three levels of reflection (Zeichner & Liston, 1987) which get at unarticulated assumptions and root metaphors and involve seeing from different perspectives.

Similarly, the work of Habermas (1974) of the Frankfurt School of Social Research also supports a critical conception of reflection. As Calderhead (1989) notes:

Reflection is viewed as a process of becoming aware of one's context, of the influence of societal and ideological constraints on previously taken-for-granted practices, and gaining control over the direction of these influences. (p.44)

The various interpretations of reflective practice which have resulted in a proliferation of reflective teaching programs and strategies (See Adler, 1991 for a comprehensive review) vary in terms of how they view the process, content, preconditions, and the product of reflection. They emphasize to differing extents the roles of problem setting, problem solving, knowledge bases, analytic and interpretative skills, and the attitudes which are brought to bear on the reflective process.

Although many concepts of reflective practice and strategies of how to educate the 'reflective practitioner' have been advanced, operationally defining reflective practice is in itself problematic. Essentially, reflective practice lacks an underlying

conceptual framework from which operational definitions of reflection, levels of reflection, and the underlying structures and processes involved in reflective practice can flow (Kirby & Teddlie, 1989; Liston & Zeichner, 1990; MacKinnon, 1987;) Empirical evidence to support the effectiveness of existing reflective strategies utilized in teacher preparation and professional development programs, even in their present state of operational definition, is lacking (Adler, 1991; Calderhead, 1989). The studies which do examine the use of reflective practice by teachers (Korthagen, 1985; MacKinnon, 1986; Oberg & Field, 1986; Russell, 1986) are exploratory in nature. They rely primarily on case study and qualitative methodology as opposed to empirical methods of inquiry.

However incomplete the empirical support for the effectiveness of reflective practice may be, such inquiry has produced some models of "levels of reflection" (Zeichner & Liston, 1987) or "frameworks for reflective thinking" (Sparks-Langer, Simmons, Pasch, Colton, & Starko, 1990) or "stages in the development of reflective judgment" (Ross, 1989b) that are useful in understanding how student teachers come to represent the problems of real life teaching. Table 2.1 provides a description of

these models of reflection.

Table 2.1 Models of Reflection

Griffiths and Tann (1992)--Five Levels of Reflection
(a) Reflection in action: likely to be personal and private.

1. Act-react (Rapid Action)

-reaction is immediate. ie. child is behaving well, a teacher may automatically give praise, while another teacher may equally automatically not.
 -the teaching action is immediate and routine, but not all teachers have same immediate and automatic reaction.

2. React-monitor-react/rework-plan-act (Repair)

-although there is a pause for thought, it is "on the spot" and very quick.
 -untrained observer will miss it.
 -ie. teacher may see children have unexpected reaction to work and adjust lesson or abandon it. Or see that a child has unexpected interest in work and make decision to allow child to pursue it rather than carry on with normal work.

(b) Reflection-on-action: likely to be interpersonal and collegial.

3. Act-observe-analyze-and evaluate-plan-act (Review)

-thought and reflection are going on after the actions are completed.
 -may happen at any time during the normal working day, after school, end of the day or end of the week.
 -teacher will muse over or talk about the progress of particular group or child. May be a result of memory or making work.
 -as a result existing plans for teaching and learning may be modified.
 -teacher may reassess how a child is to be managed or think again about group relations in the class.

4. Act-observe systematically-analyze rigorously-evaluate-plan-act. (Research)

- observation becomes systematic and sharply focused.
- process of collecting information, analysing it, and evaluating it may be a matter of weeks or months.
- tick sheets, video or diary may be used to collect information on a particular issue.
- teacher will then reflect carefully on the reasons for the way the issue has arisen in the way it has, and also on the information collecting itself (its validity and reliability).

5. Act-observe systematically-analyze rigorously-evaluate-retheorize-plan-act. (Retheorizing and reformulating)

- level of abstract, rigorous reflection which is formulated and reformulated over a matter of months or years.
- in the process the teachers' own theories will become changed and it is possible that accepted theories will be challenged.
- this level cannot occur unless the teacher is reading theory critically.

Ross (1989b)--Stages in the Development of Reflective Judgement

The Individual:

Stages 1 and 2

- Views world as simple
- Believes knowledge to be absolute
- Views authorities as the source of all knowledge

Stage 3

- Acknowledges existence of differences of viewpoints
- Believes knowledge to be relative
- Sees varying positions about issues as equally right or equally wrong
- Uses unsupported personal belief as frequently as "hard" evidence in making decisions
- Views truth as "knowable" but not yet known

Stage 4

- Perceives legitimate differences of viewpoint
- Develops a beginning ability to interpret evidence

- Uses unsupported personal belief and evidence in making decisions but is beginning to be able to differentiate between them
- Believes that knowledge is uncertain in some areas

Stages 5 and 6

- Views knowledge as contextually based
- Develops views that an integrated perspective can be evaluated as more or less likely to be true
- Develops initial ability to integrate evidence into a coherent point of view

Stage 7

- Exhibits all characteristics listed in stages 5 and 6
- Possesses ability to make objective judgments based on reasoning and evidence
- Is able to modify judgements based on new evidence if necessary

Sparks-Langer et. al. (1989)--Framework of Reflective Thinking

Level	Description
1	No descriptive language (no description provided)
2	Simple layperson description of the instructional event. ie. She used groups.
3	Events labelled with appropriate terms. ie. she used cooperative groups.
4	Explanation with tradition or personal preference given as the rationale. ie. We always use reading groups.
5	Explanation with principle or theory given as rationale. ie. interdependence in group work helps build a desire to help others learn: this sink or swim feeling keeps students committed to their own learning and that of their peers.

- 6 Explanation with principle/theory and consideration of context factors.
 ie. student characteristics,
 subject matter, or community factors.
 ie. in this class, students' social groups are generally formed along economic lines. Cooperative learning is esp. useful in such situations because it provides repeated positive experiences with children from different backgrounds.
- 7 Explanation with consideration of ethical, moral, political issues. ie. Cooperative learning is being used here because there is a split along economic lines in this community and we want students to accept and value each other in spite of these differences. Such values may contribute in the long run to saving this planet.

Zeichner and Liston (1987)--Three Levels of Reflection

1. Technical

- emphasis on the efficient application of professional knowledge to given ends.
- goals and objectives are not a subject for scrutiny, nor are long range consequences.
- Teachers and prospective teachers need to learn to reflect upon the effectiveness of their teaching strategies, have the learners achieved the given set objectives?

2. Teaching is placed within its situational and institutional contexts.

- Teachers are expected to be able to reflect upon why certain choices of practice are made.
- How are these choices constrained and influenced by institutional, social, and historical factors?
- What hidden curricula may be embedded in their practices, in the norms of the institution?
- This level of reflection goes beyond questions of proficiency at achieving particular ends towards a thoughtful examination of how contexts influence teaching and learning, and a consideration of the worth of competing educational goals.

3. Moral Ethical Issues

- thinking about teaching and learning is guided by concerns for justice and equity.
 - teachers must become "transformative intellectuals' who are capable of examining the ways in which schooling generally, and one's own teaching specifically, contribute to or fail to contribute to a just and humane society.
 - in reflection, teachers would be able to transcend everyday experience, to imagine things as they ought to be, not simply accept things as they are.
 - such images should shape the teacher's practice and their thinking about their practice.
-

Inherent in these levels is a perspective on student teachers' development of reflection which has at its centre a view of development which views change as emergent, structural, qualitative, and for the most part constructive or active. Unfortunately, these models of reflection describe only surface features of the reflection that structures teachers' thinking or, worse, only static vignettes of teachers' reflection. They stop short of specifying the underlying processes which are in operation as teachers actively construct those structures of reflection as they move from one level of reflective thinking to another. Reflection is thought to be one of the processes student teachers engage in as they attempt to represent real life classroom problems. A neo-Piagetian conceptual framework which is reviewed in the next section may provide a means for describing the

structures and processes which characterized student teachers' reflection.

D. A NEO-PIAGETIAN FRAMEWORK FOR EXPLORING STUDENT TEACHERS' REPRESENTATIONS OF REAL LIFE TEACHING PROBLEMS

As one of the dominant figures in the field of cognitive development, Jean Piaget's structural view of intelligence provided a universal, monolithic, constructivist view of the human mind. Piaget proposed that children's cognitive structures go through four stages: (1) the sensorimotor stage, (2) the preoperational stage, (3) the concrete operational stage, and (4) the formal operational stage. Each stage is characterized by a general thinking structure which is built by differentiating and coordinating existing schemata into a coherent system or psychological structure. The structure enables the child to construct a way of viewing the world. According to Piaget, these structures determine cognitive performance across domains, and so constitute a "structure d'ensemble" (structure of the whole). Using Piaget's general stage construct to analyze performance in specific domains is

fraught with difficulties, however.

Evidence against the stages include: (1) difficulties inherent in the definition and identification of general logical structures (Flavell, 1963), (2) the unevenness or discontinuity in the development of logically equivalent structures (Beilin, 1971), (3) low correlations for the emergence of same age abilities (Pinard & Laurendeau, 1969), (4) successful training of certain abilities before their age of emergence (Gelman, 1969, 1982), and (5) reinterpretation of developmental shifts as domain-specific conceptual changes (Carey, 1985). Findings such as these seem to be incongruent with Piaget's assertion that one general cognitive structure determines performance. Although neo-Piagetian theories (Case, 1985, 1991; Fischer, 1980; Halford, 1982; Pascual-Leone, 1969) have retained the concept of stage, they have undergone considerable transformation in order to refute the criticisms levied against classical Piagetian theory. First of all, general logical structures have been replaced by domain specific, individually assembled structures. For example, children's structures for logico-mathematical thought are assembled independently from their spatial structures implicit in their art.

Secondly, these neo-Piagetian theories emphasize an upper limit as an age-related constraint on cognition rather than a uniformity across same-age cognitive operations. Thirdly, the variability in the level of cognitive performance is explained by individual differences in experience, processing, and cultural factors. Last of all, neo-Piagetian theories define the constraints on stage transition in broad terms such as information processing terms such as complexity.

The theory of intellectual development which directs the research program of Robbie Case, (1985; 1987; 1991) a neo-Piagetian theorist, grew out of Piaget's structural view of intelligence and the neo-nativist and information processing views of intelligence. Case's neo-Piagetian theory of intellectual development accepts the Piagetian premise that children actively structure their experiences and that the internal processes available for bringing about this restructuring are vastly different from one stage of development to the next. Case departs from classical Piagetian theory in his detailed description of his four stages of development and the processes and mechanisms which allow movement between stages. He embraces a sociological perspective in

positing structures which are open to the influence of cultural factors. His view of the human mind is "one of a multi-level system, whose structures and processes can vary in their degree of applicability, along a continuum from specific thorough intermediate (module-wide) through general systemic" (Case, 1991, p.374). Accompanying this view of mind is a view of development in which "changes take place at all levels, in a recursive and interactive fashion, according to a process that depends on both biological and cultural/experiential factors" (Case, 1991, p.374).

Case modeled children's ability to solve problems by postulating the use of control structures or "internal blueprints" which represent the child's habitual way of solving problems. All "tripartite entities" (Case, 1991, p.48) consist of three components: (1) a representation of the current problem situation (2) a representation of the desired objective(s) and (3) a representation of the strategy or sequence of mental steps for progression from the initial states of the current problem situation to the desired outcome situation.

Case suggested four distinctly different types of thought processes which comprise the sequence of stages

of development that are encountered in the movement from birth to adulthood (see Fig 2.1):

(1) In the sensori-motor stage (1-18 months) thinking is motoric.

(2) In the relational stage (1 1/2 - 5 years) children think in terms of global relationships and the mental events are objects, people, and actions.

(3) In the dimensional stage (5 - 11 years) children think in terms of second order relations, in which the elements are categories of relations or dimensions.

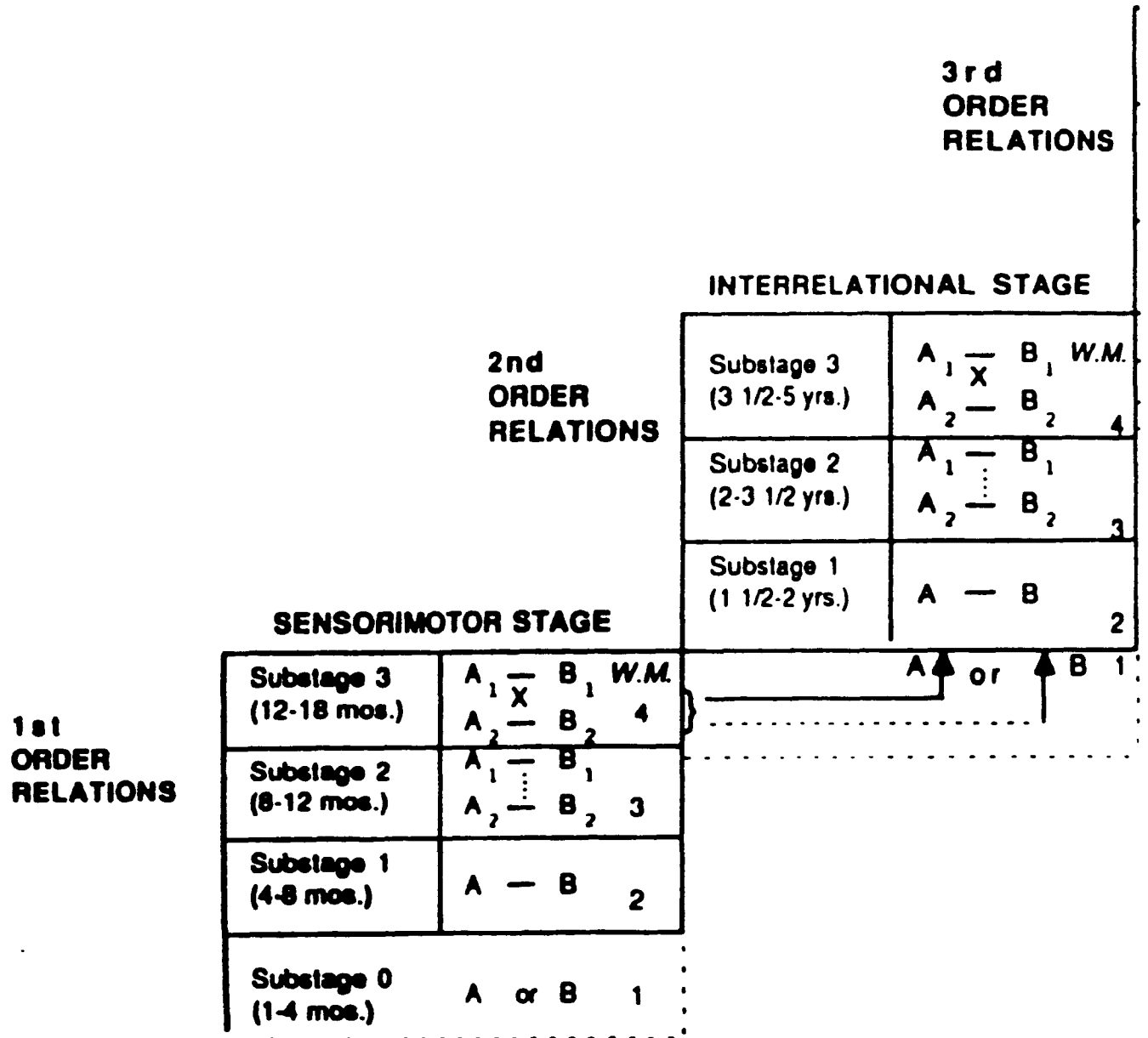
(4) In the vectorial stage (11 - 19 years) children think in terms of second order dimensions or categories, in an abstract fashion. The type of mental event encountered at each stage of development is represented by the component schemes of the control structure.

Case postulates three levels of coordination within each stage, each one defining a different substage (see Fig. 2.1) and using increasingly more powerful strategies of problem solving. "Unifocal" co-ordinations characterize the first substage of a new stage, when two schemes assembled gradually during the previous stage become hierarchically integrated (ie. one becomes subordinate to the other). This assembled unit becomes

the basic building block of the new stage. At the next substage, two of these unifocal schemes are linked in "bifocal" coordinations, in which two operations of similar complexity become co-ordinated. Finally, during the "elaborated bifocal" substage, bifocal co-ordinations become flexible and reversible, in such a way that changes in one of the component operations lead easily to compensatory changes in the other. Continued practice and streamlining results in consolidation of these structures into the units which will be hierarchically integrated at the transition to the next stage.

Case's model addresses the problem of continuity by positing a between stage transition in which the units coordinated and consolidated at the previous substage become the building blocks of the first substage of the next level. As the child moves from the last substage of one level to the first substage of the next level, there is a qualitative shift in thought. Then as the child progresses through the remaining three substages of a level, the strategies used become more quantitatively complex. The child is capable of more of the same kind of thinking.

Figure 2.1: Case's Hypothesized Structure of Stages and Substages from Birth to Adulthood



VECTORIAL STAGE*

42a

4th
ORDER
RELATIONS

Substage 3 (15 1/2-19 yrs.)	$A_1 - B_1$ W.M. $A_2 - B_2$ 4
Substage 2 (13-15 1/2 yrs.)	$A_1 - B_1$ $A_2 - B_2$ 3
Substage 1 (11-13 yrs.)	$A - B$ 2

DIMENSIONAL STAGE

Substage 3 (9-11 yrs.)	$A_1 - B_1$ W.M. $A_2 - B_2$ 4	$A \uparrow$ or $B \uparrow$ 1
Substage 2 (7-9 yrs.)	$A_1 - B_1$ $A_2 - B_2$ 3	
Substage 1 (5-7 yrs.)	$A - B$ 2	

* or ABSTRACT DIMENSIONAL STAGE

An accompanying increase in working memory capacity makes this progression possible and allows the child to focus on an additional chunk of information and integrate it into the problem solving procedure. To summarize, the child constructs quantitatively different problem solving structures as he progresses through the substages of each major stage, while qualitatively different structures mark his movement from one major stage to the next.

The processes which account for these coordinations are four information processes described by Case (1987) as: (1) schematic search, in which a second schema is sought for activation while a first schema remains active, (2) schematic evaluation, in which the usefulness of the combination of the two schemas is evaluated, (3) retagging, in which two schemes are relabelled into a single paired, or higher order scheme, so that the two schemes can be retrieved as a single operation and, (4) schematic consolidation, which involves forming a new, smoothly running unit comprising the two formerly separated schemes. These processes of development can be attributed to the larger mechanisms of development such as attentional capacity.

The mechanisms of development which set limits on the highest level of intellectual operation which can be achieved are: (1) the amount of working memory available (STSS-short term storage space) and (2) practice and instruction available in specific problem areas, especially as these problem areas become more culture bound and more abstract.

Because Case's model is domain-specific and it allows for a fine-grained analysis which specifies the structures, processes, and mechanisms available to student teachers in their growth and development toward expertise in teaching, it may prove to be a useful conceptual framework. Case's model can be used heuristically to generate a series of proposed stages in student teachers' construction of pedagogical knowledge. Specifically, it can be used to provide one means of describing student teachers' representation of their pedagogical knowledge of the problem of individual differences among learners in the classroom. Table 2.2 is one way of portraying these shifts in the student teachers' representations of the adaption of their instruction to individual difference among learners.

Table 2.2: Levels of Student Teachers' Representation of the Problem of Adapting Instruction to Individual Differences Among Learners.

Focus: is on how student teachers represent the problem of adapting their instruction to individual differences among learners, how they represent this problem, and how they pose this problem rather than the solution they offer to their most difficult problem encountered though the relation of a problem to a solution is also of importance.

Substages are a function of the number of mental elements of a particular sort which can be represented simultaneously.

Sensorimotor Substage 3 Precursory Unit:

Sensory orienting response: Student teacher has ability to notice class' reaction to her instruction while she instructs the class.
 Student teacher does not notice individual differences among learners.

Interrelational Stage 2nd Order Relations

Mental elements are objects, people, actions

Substage 1 A - B Whole class - Individual
 of learners learner

Student teacher focuses on:

Class or learners' reactions to her instruction

or individual learner's reactions to her instruction.

If student teacher's attention is focused on the individual learner, only the effect of the individual difference in that learner is noted.

Individual differences among learners are not identified or described.

If solution is offered, it is directed at the whole class and does not address individual differences

among learners.

- Substage 2 A1-B1 Whole class - Indiv learner
 A2-B2 Effect of indiv diff of learner
 Student teacher focuses on:
 class of learners' reaction to her instruction
while noticing one specific instance of an effect of an
 individual difference in an individual learner's
 response to her instruction.
 If solution is offered, it is a simplistic or global
 solution directed at either the whole class of
 learners or at the specific instance of an
 individual difference in one learner.
- Substage 3 A1-B1 Whole class - Indiv learner
 A2-B2 Variable of 1 indiv diff
 Student teacher focuses on:
 class' reactions to her instruction while noticing
 and identifying 1 individual difference of an
 individual learner's response to her instruction.
 Simplistic solution is offered which attempts to
 address the individual difference of an identified
 learner but is directed at the class of learners as
 a whole.

Dimensional Stage 3rd Order Relations

Mental elements are categories of relations or
 dimensions

Student teacher is able to represent the problem/aspect
 of individual differences along a dimension of a given
 variable. There is a recognition of the complexity of
 the problem and a notion of balance or tradeoff between
 student needs and student teacher's instruction.

- Substage 1 A - B Index - Range of Indiv Difference
 Student Teacher focuses on:
 One index of individual learner difference.
 Range of the individual difference is
 identified.
 Effect of individual difference in 1 learner
 and cause of individual difference is noted.
 Solution is offered but it may be a simplistic or
 general solution that meets the needs of the class

or a subgroup of learners but is not tailored to the actual individual difference identified among learners.

Substage 2 A1-B1 Index - Range of Indiv Difference
A2-B2 Whole Class - Individual Learner

Student Teacher focuses on:

One index of individual learner difference.

Range of the individual difference is identified.

Complexity of the problem is acknowledged.

Notion of balance between individual or class needs and student teacher's instruction is indicated but not elaborated on.

Solution stated is a general solution or standard to be achieved. It is designed to meet whole classroom needs or subgroup of learners not individual difference identified in a learner.

Goal may be stated but not integrated into instruction or solution.

Substage 3 A1-B1 Index - Range of Indiv. Difference
A2-B2 Whole Class - Individual Learner

Student teacher focuses on:

Detailed description of the index of individual difference.

Range of individual difference is indicated.

Complexity of the problem is acknowledged.

Notion of balance between learner individual difference needs and student teacher's instruction is described.

Solution described is designed to meet individual difference in learner rather than just the whole class or subgroup of learners' needs.

Goal to be achieved is integrated into the solution

Vectorial or Abstract Dimensional Stage 4th Order Relations

Mental elements are second order categories

Substage 1 A - B Std. T's Instrn - Indiv Learner Diff
Student teacher focuses on:

One index of individual difference among learners.

Range of individual difference is identified.

Complexity of the problem is acknowledged.
Notion of balance between learner needs and student teacher's instruction and needs of whole class are described.
Solution involves adjustments in student teacher's actions, beliefs and expectations to meet individual learner's actions, beliefs, and expectations in an interactive way (One affects the other).

Substage 2 A1-B1 Std. T's Instrn. - 2 or more Indiv
Learner Diffs

A2-B2 Std. T's Monitoring - Indiv Feedback

Student teacher focuses on:

- Two or more indices of individual differences.
- Range of individual differences are identified.
- Complexity of problem is acknowledged.
- Notion of balance between learners' indiv. diffs and whole group's needs or student teacher's instruction is described.
- Solution involves adjustments on student teacher's part to meet individual learner needs. Solution features monitoring learner's actions, assessing their reactions and taking learner's feedback into account during solution phase to the problem.

Substage 3 A1-B1 Std. T's Instrn - 2 or more Indiv.
Learner Diffs

A2-B2 Std. T's Monitoring - Indiv Feedback

Student teacher focuses on:

- Two or more indices of individual differences.
- Range of individual difference is identified.
- Complexity of problem is acknowledged.
- Notion of balance between indiv diff of learner and whole class needs or student teacher's instruction is described.
- Solution involves adjustments in both student teacher's actions, beliefs and expectations and individual learner's actions, beliefs and expectations in an interactive way.
- Solution proceeds in an integrated fashion involving adjustments on both student teacher and learner's parts to meet individual differences of the learner.
- Student teacher is able to view the individual difference from the learner's point of view.

Acknowledgement that there is no systematic, effective, single, identifiable solution but rather multiple solutions ordered across time.

Although it is difficult to specify the content or aspects of student teachers' representations as they think about problem situations, goals, and strategies associated with adapting their instruction to individual differences among learners, Case's conceptual framework gets beyond the what and specifically addresses the how. Debate in the literature over what beginning teachers reflect upon, that is, classroom management routines and issues, ethical, social, and moral issues (Gore & Zeichner, 1991; Grossman, 1992), becomes less significant in the face of the question concerning just how it is that student teachers construct their representation of the individual difference problem. This adaptation of Case's theory of intellectual development provides the machinery for an inquiry into the development of the structures and processes utilized by student teachers in their representation of real teaching problems. Because Case's neo-Piagetian conceptual framework focuses on the structures and processes of intellectual development, it

may prove to be a useful tool in uncovering student teachers' representations of real life teaching problems and their restructuring of these representations over the course of the practicum as it allows for a much more specific, detailed, fine-grained analysis of their developmental process in the domain of teaching.

In the present study, a longitudinal sampling of student teachers' representations of the problem of adapting instruction to individual differences among their learners will be examined using Case's (1985, 1991) theory to conceptualize and predict developmental change. The levels of student teachers' representation of the problem of individual differences described in Table 2.2 will be developed further in Chapter 3.

E. SUMMARY

The nature of the present study is to explore the ways in which student teachers represent real life teaching problems and the ways in which these representations change over the course of the practicum experience. The major purpose of this study is to generate hypotheses about this research question. The emphasis is on the description of phenomena and on the

development of hypotheses from a data base as opposed to the formal setting, testing, and confirmation of hypotheses. Such an inquiry is supported by the review of the literature which has incorporated the perspectives of the theory-practice dilemma in teacher education, the research on teachers' thought processes and the contributions of the growing movement of reflective practice in an attempt to build the research questions of this study, namely:

- (1) How do student teachers represent the real life teaching problem of adapting their instruction to the individual differences among learners?
- (2) How do student teachers' representations of real life teaching problems change over the course of their practicum experience?
- (3) Are the structures and processes of Case's (1985, 1987, 1991) neo-Piagetian perspective useful theoretical tools to address the development of student teachers' ability to represent real life teaching problems?

In order to explore how student teachers represent the real life teaching problem of adapting their instruction to individual differences among learners, a means for operationally defining the terms associated with each of the four questions posed will be provided. Chapter Three will describe these procedures and methods.

CHAPTER III: METHODOLOGY

In order to describe how student teachers represent the real life teaching problem of adapting their instruction to individual differences among learners, student teachers' responses over the course of a thirteen week practicum to the following three sets of two questions will be explored (See Appendix A):

Prior to the Practicum Experience:

1. What is your definition of individual differences among pupils?
2. What aspects of individual differences do you think are likely to be problematic for teaching. Why?

During the Fourth and Ninth Weeks of the Practicum Experience:

1. Describe the most difficult problem you have had in adapting your teaching to individual differences among your pupils during these first weeks (these past four weeks).
What steps did you take to resolve this problem?
2. What have been the most important individual differences to take into account when teaching this particular group of pupils. Give an example of an attempt to meet these differences that you were most satisfied with.

Similarly, student teacher faculty supervisors were asked to rank the student teachers on a seven point Likert scale in response to the following question and provide examples of the student teachers accommodation of individual differences among learners at the fourth and

ninth weeks of the practicum:

1. How well has the student teacher been able to accommodate individual differences among learners?
2. Give one or more examples of how the student teacher accommodated individual differences among learners.

A. DESCRIPTION OF THE SAMPLE

The sample consisted of 39 student teachers participating in their extended thirteen week practicum and 12 faculty supervisors (4 males and 8 females) responsible for the students. Participants were 19 male and 20 female students in the two year Intermediate Teacher Education Program and they were assigned to intermediate level teaching situations ranging from grades 4-7 during the extended thirteen week practicum experience. They had completed most of their course work, including most of their methodology courses and had participated in a two week practicum experience earlier in the teacher education program. This practicum experience consisted primarily of student and teacher observation with limited classroom assistance in the form of small group instruction, tutoring, and individual student assistance on in-class assignments. The 39 student teachers were student teachers for which a

complete data set was available.

Elementary student teachers were selected for study over secondary student teachers because it was felt that they had more opportunity to interact with a fixed number of students across the school day. It was also felt that by remaining with a smaller number of pupils, student teachers had more opportunity to monitor the individual differences among learners and adapt their instruction accordingly. Secondary schools available for study typically had class periods of fixed time lengths, and often with different students in each time period.

Intermediate student teachers were selected for study over primary student teachers because opportunities for observing how student teachers deal with the individual differences problem were more available. Although the emphasis in primary classrooms was on individualized learning with only brief thirty second to several minutes of group instruction such as introductions or directions on how to do an activity, the intermediate level included both informational lessons and individualized teaching and learning situations. It was felt that the intermediate classroom provided an instructional context which contained both types of

instruction and constituted a teaching environment that was more representative of the real world of teaching and the dilemmas inherent in the complex task of everyday teaching.

Four male and eight female Faculty supervisors observed subsets of the intermediate student teachers ranging in number from two to six. Over the course of the thirteen week practicum, faculty supervisors observed student teachers on approximately seven separate occasions for at least one hour.

B. PROCEDURES

Three student teacher and two faculty supervisor questionnaires were used to explore "how" student teachers represent the real life teaching problem of adapting their instruction to individual differences among learners over the course of the practicum experience. The description of the questionnaires is divided into five sections: (1) Questionnaire Rationale, (2) Questionnaire Description, (3) Questionnaire Administration, (4) Rating Criteria and Example of Student Teachers' Responses, and (5) Rating Criteria and Examples of Faculty Supervisors' Observations and Rating Forms. Section (6) will include a discussion of the

general nature of the individual differences which student teachers noted.

(1) Questionnaire Rationale

The rationale for the development of the questionnaire was three fold. First of all, it provided an opportunity to evaluate the intermediate teacher education program. Second, it allowed for an opportunity to track student teachers' development in the areas of classroom management, pacing, curriculum, and lesson planning, as well as individual differences in their movement toward expertise. Third, its format included both open-ended responses from student teachers and rating forms and observations from their faculty supervisors. The triangulation employed in this study allowed for a blend of process tracing and ethnographic methods of inquiry. Such a method of inquiry is supported by research which advocates that research of this nature should be based on natural rather than experimental methods (Elbaz, 1988; Goodman, 1988; Mitchell & Marland, 1989). Such a method of inquiry permitted a close examination of the subtleties of the development of student teachers' problem representation

over the course of the practicum experience. In the present study, the questions of adapting instruction to individual differences among learners were used to elicit written responses from student teachers in order to provide a way of exploring the structures and processes they might have available for representing the individual difference problem.

(2) Questionnaire Description

The three sets of two questions about individual differences among learners which student teachers received were part of a larger questionnaire which also addressed the topic areas of: (1) classroom management, (2) pacing, (3) curriculum, (4) lesson planning. Each page of the questionnaire was devoted to one topic and typically contained two questions about that topic followed by a paragraph-length blank space for response elaboration. Students were able to use additional space for longer answers. The questionnaire given to the student teachers immediately prior to the practicum experience ("Pre-Practicum Questionnaire") focused on the problems and issues which student teachers anticipated in the five topic areas. The other two questionnaires

("Practicum - First Half" and "Practicum - Second Half") completed during the practicum asked student teachers to reflect on the topics as they actually experienced them in their practice teaching.

The two sets of questionnaires given to the faculty supervisors consisted of observation and rating forms addressing each of the five topic areas. Again, each page of the questionnaire was devoted to one topic and typically contained a seven point rating scale (a line with seven points marked on it with the end points of minimal accommodation (1) to considerable accommodation (7) identified) and a question which elicited faculty supervisors' observations of the student teacher in that area followed by a paragraph-length blank space for response elaboration. Most faculty supervisors worked with twelve student teachers in both intermediate and primary levels of the elementary teaching program yet only completed questionnaires on their intermediate level student teachers. As supervision of student teachers constituted the faculty supervisors entire teaching load for the term, all of their time could be devoted to observation of student teachers.

(3) Questionnaire Administration

Immediately prior to their practicum experience, consenting student teachers were asked to complete the "Pre-Practicum Questionnaire" in one sitting. Completion of the "Practicum: First Half Questionnaire" by student teachers began in week three of the practicum after an opportunity for introduction to and immersion in classroom learning during weeks one and two. Each topic area was scheduled for completion on a single week. After completion of the five topics for the first half of the practicum (weeks 1-7), student teachers returned their questionnaires in sealed envelopes to their faculty supervisors. A similar procedure was followed for the second half (weeks 8-12) of the practicum in which student teachers returned their "Practicum: Second Half Questionnaire" in week thirteen. The individual learner differences topic questions were scheduled for week four and week nine. Supervisors completed their two questionnaires (rating and observation forms) during the same weeks as the student teachers.

(4) Rating Criteria and Example of Student Teachers' Responses

The student teachers' responses to the two questions

answered prior to the practicum experience and during the fourth and ninth weeks were a probe as to how student teachers represent the real life teaching problem of adapting their instruction to individual differences among learners. Each of the two questions prior to and over the course of the practicum experience were rated according to the criteria specified in the following discussion. Each contains examples of student teachers' responses as they relate to the rating criteria. Aspects of the two questions include: (1) an assessment of what student teachers believe are the most important individual differences to take into account when teaching and, (2) a description of the student teachers' most difficult problem in adapting their teaching to individual differences among learners and the steps they took to resolve this problem.

1. Level of Problem Representation:

Pre-Practicum: What aspects of individual differences do you think are likely to be problematic for teaching?

4th/9th Weeks: What have been the most important individual differences to take into account when teaching this particular group of students? Give an example of an attempt to meet these differences that you were most satisfied with.

Student teachers' responses to the pre-practicum format of this question provided a baseline of their

level of problem representation while their responses during the fourth and ninth weeks gave a measure of their growth in level of problem representation over the course of the practicum. Student teachers' responses to this question were scored according to the Levels of Student Teachers' Representation of the Problem of Adapting Instruction to Individual Differences Among Learners based on Case's (1985, 1991) neo-Piagetian conceptual framework (see Table 3.1).

Table 3.1 Levels of Student Teachers' Problem Representation: Scoring Categories and Examples

Note: Substages are characterized by the number of mental elements of a particular sort which can be represented simultaneously.

Case's Neo-Piagetian
Theory of Intellectual
Development

Application to Student
Teacher's Representation
of Real Life Teaching
Problems

Sensorimotor Substage 3 Precursory Unit:

Sensory orienting response: Student teacher has ability to notice class' reaction to her instruction while she instructs the class.
Student teacher does not notice individual differences among learners.

Interrelational Stage 2nd Order Relations

Mental elements are objects, people, actions

Substage 1 A - B Whole class - Individual
of learners learner

Student teacher focuses on:

Class or learners' reactions to her instruction

or individual learner's reactions to her instruction.

If student teacher's attention is focused on the individual learner, only the effect of the individual difference in that learner is noted.

Individual differences among learners are not identified or described.

If solution is offered, it is directed at the whole class and does not address individual differences among learners.

Example: "The slower students need extra help and it is imperative that they get it. I would offer help at lunch or after school."

Substage 2 A1-B1 Whole class - Individual learner
A2-B2 Effect of indiv diff of learner

Student teacher focuses on:

class of learners' reaction to her instruction

while noticing one specific instance of an effect of an individual difference in an individual learner's response to her instruction.

If solution is offered, it is a simplistic or global solution directed at either the whole class of learners or at the specific instance of an individual difference in one learner.

Example: "I'm noticing only one problem and that is with a boy who seems to be challenging me. He continues to shout out inappropriate answers and I continually move him to the back."

Substage 3 A1-B1 Whole class - Individual learner
A2-B2 Variable of 1 indiv diff

Student teacher focuses on:

class' reactions to her instruction while noticing and identifying 1 individual difference of an individual learner's response to her instruction.

Simplistic solution is offered which attempts to address the individual difference of an identified learner but is directed at the class of learners as a whole.

Example: "behavioral problems...While teaching lessons, constantly it has been the same group of individuals who are off task. Setting rules and expectations for off task

behavior has reduced the number of interruptions during lessons."

Dimensional Stage 3rd Order Relations

Mental elements are categories of relations or dimensions

Student teacher is able to represent the problem/aspect of individual differences along a dimension of a given variable. There is a recognition of the complexity of the problem and a notion of balance or tradeoff between student needs and student teacher's instruction.

Substage 1 A - B Index - Range of Indiv Diff.

Student Teacher focuses on:

One index of individual learner difference.

Range of the individual difference is identified.

Effect of individual difference in 1 learner and cause of individual difference is noted.

Solution is offered but it may be a simplistic or general solution that meets the needs of the class or a subgroup of learners but is not tailored to the actual individual difference identified among learners.

Example: "Some are more willing to try new ideas and challenges while others are afraid of being wrong. It is important to reassure the students and offer encouragement and reinforcement. They need to be encouraged as much as possible since most of them suffer from low self-esteem to begin with."

Substage 2 A1-B1 Index - Range of Indiv Difference

A2-B2 Whole Class - Individual Learner

Student Teacher focuses on:

One index of individual learner difference.

Range of the individual difference is identified.

Complexity of the problem is acknowledged.

Notion of balance between individual or class needs and student teacher's instruction is indicated but not elaborated on.

Solution stated is a general solution or standard to be achieved. It is designed to meet whole classroom needs or subgroup of learners not individual difference identified in a learner.

Goal may be stated but not integrated into instruction or solution.

Example: "They are all at various writing stages. Some may write complete sentences while some are not even sure what a sentence is. Those requiring extra help I let the 'better' sentence writers partner up and help. I also circulated to help."

Substage 3 A1-B1 Index - Range of Indiv Difference
A2-B2 Whole Class - Individual Learner

Student teacher focuses on:

Detailed description of the index of individual difference.

Range of individual difference is indicated.

Complexity of the problem is acknowledged.

Notion of balance between learner individual difference needs and student teacher's instruction is described.

Solution described is designed to meet individual difference in learner rather than just the whole class or subgroup of learners' needs.

Goal to be achieved is integrated into the solution

Example: "The various skill levels of the students at grasping and understanding new concepts, such as how to use "scale of distance" , was something that I constantly had to deal with. The only way I dealt with the high to low skill levels was to reteach the whole group at times, provide very simplistic steps as to how to apply the concept, and monitor and individualize instruction for those having difficulty."

Vectorial or Abstract Dimensional Stage 4th Order Relations

Mental elements are second order categories

Substage 1 A - B Std. T's Instrn - Indiv Learner Diff
Student teacher focuses on:

One index of individual difference among learners.

Range of individual difference is identified.

Complexity of the problem is acknowledged.

Notion of balance between learner needs and student teacher's instruction and needs of whole class are described.

Solution involves adjustments in student teacher's

actions, beliefs and expectations to meet individual learner's actions, beliefs, and expectations in an interactive way (One affects the other.

Example: "The different levels within the groups of students within creative writing. It is not the same problem with students in their writing. It is either punctuation, spelling, capitals or omissions. That makes it hard for me as a student teacher to handle all these different concerns and problems with a class of 30 different individuals. I find that when the student are doing creative writing, I talk to each individual or group of individuals who are having problems with the same element of writing. By giving each individual a thing to look at and to be aware of in their own writing."

Substage 2 A1-B1 Std. T's Instrn. - 2 or more Indiv
Learner Diffs

A2-B2 Std. T's Monitoring - Indiv Feedback

Student teacher focuses on:

Two or more indices of individual differences.
Range of individual differences are identified.
Complexity of problem is acknowledged.
Notion of balance between learners' indiv. diffs and whole group's needs or student teacher's instruction is described.
Solution involves adjustments on student teacher's part to meet individual learner needs. Solution features monitoring learner's actions, assessing their reactions and taking learner's feedback into account during solution phase to the problem.

Example: None present in the data set.

Substage 3 A1-B1 Std. T's Instrn - 2 or more Indiv.
Learner Diffs

A2-B2 Std. T's Monitoring - Indiv Feedback

Student teacher focuses on:

Two or more indices of individual differences.
Range of individual difference is identified.
Complexity of problem is acknowledged.
Notion of balance between indiv diff of learner and whole class needs or student teacher's instruction is described.
Solution involves adjustments in both student teacher's actions, beliefs and expectations and

individual learner's actions, beliefs and expectations in an interactive way.
Solution proceeds in an integrated fashion involving adjustments on both student teacher and learner's parts to meet individual differences of the learner.
Student teacher is able to view the individual difference from the learner's point of view.
Acknowledgement that there is no systematic, effective, single, identifiable solution but rather multiple solutions ordered across time.

Example: None present in the data set.

The example of a student teacher's response used to illustrate the Dimensional Stage, Substage 3 in Table 3.1 supplies an instance of the differing levels of student problem representation. The identification of the variable of individual difference: "understanding of new concepts such as how to use scale of distance" and the illusion to "various skill levels" and "high and low skill levels" suggest the student teacher is able to represent the variable of individual difference and the dimension of the problem as the range of skill level from high to low. The notion of balance between meeting high and low level student needs is communicated on her solution to the problem. Although she starts out by reteaching the whole group, she offers other solutions: "provide very simplistic steps as to how to apply the concept", "monitor and individualize instruction for

those having difficulty" which suggest she understands that there is a relationship between how she instructs and how students learn.

In contrast, the example of the student teacher's response at the Interrelational Stage, Substage 3 in Table 3.1 illustrates the qualitative difference between these levels. While the student is able to state what the index of individual difference is, he states it in terms of the actions of a group of learners: "behavioral problems...it has been the same group of individuals who have been off task." No range of high to low incidence of this individual difference is indicated in the student teacher's response. The student teacher's representation remains focused on the group rather than on the individual. The solution: "setting rules and expectations for off task behavior" is rather general and simplistic in that it is a blanket solution directed at the behavior of the whole group rather than the needs of the individuals which are causing them to act out or the specific individual differences among the learners of the group. There is no acknowledgement in the student teacher's representation of the relationship between the student teacher's instruction and the effect it has on

the individual students in the class or their reactions to that instruction.

2. Description of Problem Representation:

Pre-Practicum: What is your definition of individual Differences among pupils?

4th/9th Weeks: Describe the most difficult problem you have had adapting your teaching to individual differences among your pupils? What steps did you take to resolve this problem?

Student Teachers' responses to this question were analyzed for the presence of the three components which constitute Case's (1985) higher-order unit or control structure:

- (1) a representation of the problem situation, that is, a representation of the conditions for which the plan is appropriate;
- (2) a representation of their most common objectives in such a situation, that is, the conditions which they desire, and toward whose achievement their plan is directed;
- (3) a representation of the strategy they employ, that is, the set of mental steps that they develop for going from the problem situation to the desired situation in as efficient a manner as possible. (p.68-69)

The number of aspects of each of these components was counted in the student teachers' responses.

(5) Rating Criteria and Examples of Faculty Supervisors' Observations and Rating Forms

Faculty supervisors rating forms and observations

provided a means of triangulation to check on how well student teachers were able to translate their representation of the problem of individual differences into action. Responses were scored along a 7 point Likert scale which represents a continuum from low to high levels of accommodation of individual differences. Table 3.2 provides a description and examples of faculty supervisors' observations of student teachers' accommodation of individual differences at each of the seven points.

Table 3.2 Rating Criteria and Examples For Faculty Supervisors' Rating Forms and Observations

Rating Forms	Observations
1 Minimal Accommodation	Relatively little note taken by the student teacher of the possibility of individual differences among learners. "Indifferent to individual differences" "Not very involved with this aspect of teaching yet" "No evidence of adjusting work to individual student needs"
2	Instruction is uni-directional from student teacher to learner. Instruction is geared to meet the needs of the whole group or subgroups without much attention given to the needs of the learners within these groups. "Used what's in place before arrival"

- "Treat subgroup of individual differences ie. ESL, the same, same instruction given"
- 3 Instruction is uni-directional from student teacher to learner. Limited personal interest taken in learners.
 "Although writing activities may be divergent in nature, students are given the same workload"
 "Class is taught as a whole"
- 4 Mid Some individualized instruction is given to students.
 One area or one way of accommodating individual differences is mentioned.
 "Individual tutoring"
 "Group or buddy teaching is used to pull in students who participate minimally in activities"
 "Use of visual aids for motivation and illustration of concepts"
- 5 Student teacher is able to receive some feedback from the learners.
 Two areas of individual differences or two ways in which individual differences are accommodated are noted.
 "Accommodation according to interest and ability"
 "Assessment used to determine levels of ability"
 "Exemptions and different goals for different individual needs"
 "Challenging students to think on their own"
 "Given both written and verbal instructions when required"
- 6 Individual needs shape the activities and curriculum choices.
 Monitoring and feedback are means identified to assess individual diffs.
 "Each child creates their own spelling"

lists from words with which they are unfamiliar"
 "Individualized learning programs"

- | | |
|------------------------------|--|
| 7 Considerable Accommodation | <p>Two way, bi-directional nature to student teacher and learner interactions.</p> <p>Student teacher attempts to take the child's point of view in all interactions.</p> <p>Student is an equal partner in determining what they will learn.</p> <p>"Open-ended assignments, student choice"</p> <p>"Expectations for work produced by differs from individual to individual"</p> <p>"Students are held responsible for their own learning and achievement"</p> |
|------------------------------|--|
-

(6) General Analysis of the Nature of the Individual Differences Noted By Student Teachers and Faculty Supervisors

While student teachers' representation of the individual difference problem and the use of Case's neo-Piagetian conceptual framework as a theoretical tool for its elucidation form the main analysis, it is of some interest to note the nature of individual difference problems which student teachers and faculty supervisors identified. The information gleaned from such an analysis of the student teachers' responses may influence their representation of the problem of individual differences and its impact on their instruction over the

course of the practicum experience. The nature of individual differences noted by faculty supervisors may indicate the individual differences which are particularly salient to them in their evaluation of student teachers' instruction and ability to accommodate individual differences during the practicum experience.

C. SUMMARY

The data that the questionnaires yield will provide a basis for addressing the research questions and their related hypotheses of:

- (1) Student teachers who have a more complex representation of the problem of adapting instruction to individual differences among students will propose solutions that are more flexible in their accommodation of individual student differences.
- (2) Student teachers' representations of the problem will become more complex over the course of the practicum experience as would be predicted by Case's neo-Piagetian theory of intellectual development.
- (3) The structure and processes of Case's neo-Piagetian theoretical perspective will provide an adequate theoretical framework from which to conceptualize the development of student teachers' ability to represent the problem of adapting their instruction to the individual differences among students.

Chapter Four will provide an indepth discussion of the results as they relate to research questions and findings.

CHAPTER IV: RESULTS

This chapter will provide an exploratory discussion of student teachers' responses to each of the three sets of two questions about individual differences among learners posed to them as part of a larger questionnaire and the faculty supervisors' two sets of ratings and observations. The quantitative analysis will consist of an examination of the raw data obtained from participants for each variable and a discussion of the frequency tables pertaining to overall group responses. Also, an analysis of the nature of individual differences which student teachers and faculty supervisors identified may provide additional information of interest to the present study. Comparisons between student teachers rated high and student teachers rated low on the variables of level and description of problem representation may provide further insight into the similarities and differences with respect to how student teachers represent the real life teaching problem of adapting instruction to individual differences among learners. Questions raised as a result of the discussion will be presented with and elaborated upon in Chapter Five.

Student teachers were presented with three sets of two questions about individual differences among learners. The two questions asked before the thirteen week practicum experience were designed to assess student teachers' definition of individual differences among learners and predict their impact on their teaching. The two questions asked in the fourth and in the ninth weeks were designed to elicit student teachers' level of problem representation, and their description of the situation, objectives, and strategies employed in an individual differences problem. An examination of responses may provide an interesting insight into the research questions: How do student teachers represent the real life teaching problem of adapting instruction to individual differences among learners? and How do these representations change over the course of a thirteen week practicum experience?

Identification of Student Teachers' and Faculty Supervisors' Ratings

Table 4.1 provides the levels of problem representation coded for the student teachers over the course of the practicum experience (01 = sensorimotor stage, substage 3 to 07 = vectorial stage, substage 1;

see Appendix C for a description of the codes for levels of problem representation). Table 4.1 also provides the faculty supervisors' seven point Likert scale ratings on how well student teachers accommodated individual differences among learners during the practicum experience (01 = minimal accommodation to 07 = considerable accommodation). Table 4.2 provides the description of the problem representation coded for the student teachers during the course of the practicum experience (see Appendix C for a description of codes for description of the problem representation). Each student teacher retains the identification number originally assigned to him or her as part of the larger teacher education program evaluation study. The three sets of two questions can be found in Appendix A. Within the present chapter, each example used to describe the results will be labelled as follows: (See Appendix A, question #00; see Table 4.1 or 4.2, Subject #000). This will provide the reader with a relatively efficient method of identifying student teachers' ratings on the three sets of two questions used in the present study from the larger questionnaire.

Table 4.1: Student Teachers' Level of Problem Representation (PR) Prior to, and at the 4th and 9th Weeks of the Practicum Experience

Subject (n=39)	Prior PR	4th Week PR	Sup Rating	9th Week PR	Sup Rating
001	05	06	05	07	06
003	01	03	07	01	06
004	05	05	05	04	06
006	05	04	04	04	06
011	03	02	02	02	04
014	04	03	03	03	05
015	03	04	06	03	03
016	04	04	04	05	04
017	02	05	05	03	07
018	05	03	05	05	06
021	02	05	05	05	06
026	00	04	04	04	04
041	03	04	04	03	03
042	04	01	01	03	03
043	05	06	04	06	04
044	05	03	02	05	02
045	03	04	01	03	02
082	07	05	06	07	07
083	02	01	06	03	06
111	01	03	02	07	03
113	02	04	07	04	06
114	00	01	02	03	02
115	03	04	05	05	06
125	01	01	05	03	06
131	03	04	05	04	05
132	00	02	04	04	03
133	02	02	05	04	05
134	00	03	04	04	05
142	02	03	07	04	04
143	01	03	02	04	02
144	03	04	07	05	05
152	04	03	04	03	04
156	02	03	06	05	05
157	06	05	03	05	04
158	02	04	05	04	06
163	04	02	06	04	06
164	00	01	04	03	04
171	05	04	05	04	06
172	06	06	06	07	06

Table 4.2 Student Teachers' Description of the Problem Representation During the Practicum Experience

Subject (n=39)	4th Week			Prob Sitn.	9th Week	
	Prob Sitn.	Prob Obj.	Prob Strategy		Prob Obj.	Prob Strategy
001	04	01	02	03	01	03
003	03	00	03	02	00	02
004	04	01	02	02	00	00
006	03	01	02	02	00	01
011	02	00	01	02	00	02
014	02	00	03	01	00	02
015	03	01	04	03	00	00
016	02	00	01	02	01	02
017	02	00	01	02	00	01
018	03	01	03	04	01	03
021	04	00	00	04	01	03
026	02	00	02	02	01	02
041	02	01	03	02	00	03
042	01	01	01	02	00	01
043	04	01	01	04	01	01
044	01	01	02	02	01	01
045	03	01	02	03	00	01
082	05	01	04	03	01	04
083	02	01	00	02	01	02
111	02	01	01	06	01	04
113	03	01	02	02	01	03
114	01	00	01	02	00	01
115	03	01	02	04	01	02
125	02	00	01	04	01	05
131	02	01	03	03	01	03
132	02	00	01	03	01	01
133	02	00	01	03	01	01
134	02	01	02	01	00	02
142	03	01	00	03	01	02
143	02	00	02	03	01	02
144	03	01	02	03	01	01
152	02	01	02	02	00	01
156	02	00	01	03	01	03
157	02	01	03	03	01	04
158	04	01	02	03	01	03
163	02	01	02	05	01	05
164	02	00	01	03	00	01
171	04	01	03	04	01	03
172	03	02	03	05	02	03

Interrater Reliability

A random selection of twenty of the sets of responses were coded by a second rater using the categorical descriptions outlined in chapter 3. The initial percentage of agreement between the two raters was: 88% for levels of problem representation, 85% for the description of the problem representation, and 90% for the general analysis of individual differences noted by student teachers and faculty supervisors. In all instances, disagreement differed by only one category in the initial independent coding. After discussion, consensus was reached on cases of disagreement and 100% agreement between the two raters was obtained.

A. MAIN ANALYSIS

The results will be presented and discussed in the following three sections:

1. Student Teachers' Levels of Problem Representation
2. Student Teachers' Description of the Problem Representation
3. Faculty Supervisors' Ratings and Observations

In addition, the nature of the individual differences noted by student teachers and faculty supervisors will be examined as other variables of interest to the present

study.

1. Student Teachers' Levels of Problem Representation

The question: "What aspects of individual differences do you think are likely to be problematic for teaching?" asked of student teachers prior to the practicum experience provided a baseline of their level of problem representation. The parallel question: "What have been the most important individual differences to take into account when teaching this particular group of students?" asked of student teachers during the fourth and ninth weeks gave a measure of their levels of problem representation during the practicum experience. Student teachers' responses to these questions will be examined in terms of levels of representation of the problem of adapting instruction to individual differences among learners as adapted from Case's (1985, 1991) neo-Piagetian theory of intellectual development.

Responses were rated according to the complexity of the student teachers' thinking about the problem of individual differences and assigned a stage and substage which matched the complexity of their problem representation (See Chapter 3 for a description of the

Levels of Student Teachers' Problem Representation). Tables 4.3, 4.4, 4.5 provide a distribution of the ratings for level of problem representation over the course of the practicum experience.

Table 4.3: Frequency Table for Levels of Problem Representation (PR) Prior to the Practicum

	PR Level*	Frequency (n=39)	Percent
Sensorimotor			
3	0	5	12.8
Interrelational			
2	1	4	10.3
3	2	8	20.5
4	3	7	17.9
Dimensional			
2	4	5	12.8
3	5	7	17.9
6	6	2	5.1
Vectorial			
7	7	1	2.6

*Lowest to Highest Levels of Problem Representation

Prior to the practicum experience, student teachers' levels of problem representation were distributed throughout the levels of problem representation with clusterings at the sensorimotor stage, substage 3, the interrelational stage, substage 2, and the dimensional stage, substage 2. Although the largest group of student teachers had a lower level of problem representation (interrelational stage, substage 2), there was also a

group of student teachers at the lowest level of problem representation (sensorimotor stage, substage 3) and a group of student teachers at a higher level of problem representation (dimensional stage, substage 2).

Of the total number of student teachers ($n=39$), 5 or 12.8% of student teachers gave sensorimotor stage, substage 3 level of problem representation responses. The following is an example of a sensorimotor stage, substage 3 responses:

I'm not sure that any individual differences will be particularly problematic. I hope all my students get some enjoyment and meaning out of the activities I plan for them (See Appendix A, Question 7b; See Table 4.1, Subject #026).

The student teacher is focused on orienting himself to the learners as a class and the learning activities unfolding before him. He does not notice individual difference among learners.

Of the total number of student teachers ($n=39$), 8 or 20.5% of student teachers representation of the problem of individual differences was characteristic of the interrelational stage, substage 2. The following is an example of an interrelational stage, substage 2 response:

When one student deviates from the other students in academic ways it can cause problems for teaching a classroom of students

(and the student, teacher, or remainder of the class). (See Appendix A, Question 7b; See Table 4.1, Subject #142)

Responses rated at the interrelational stage, substage 2 of the levels of problem representation suggest that the student teacher is able to focus on the classes' reaction to her instruction while noticing one effect of an individual difference in an individual learner's response to her instruction. Seven or 17.9% of the student teachers' responses were also situated at the interrelational stage in the substage 3 level of problem representation suggesting an ability to identify one individual difference of a learner's response to class instruction while noticing the whole classes' reaction to instruction.

By contrast, 7 or 17.9% of student teachers' responses reflected a higher level of problem representation, that is, at the dimensional stage, substage 2. The following is an example of a dimensional stage, substage 2 response:

Differences in cognitive abilities-especially the ability to speak English, but also just generally make it difficult for me to cater to all these different levels without feeling that either the needs of those at the very high and low ends are being ignored. Also,

differences in maturity level in grade seven appear to make classroom discipline rather problematic (See Appendix A, Question 7b; See Table 4.1, Subject #001).

At this stage, the student teacher is able to identify an index of individual difference, describe the range of ability levels, note the complexity of the problem, and indicate a notion of balance or tradeoff involved in meeting the range of ability levels.

Only one student teacher's response showed a vectorial stage, substage 1 level of problem representation. Such a response indicates an awareness of not only the elements noted at the dimensional stage, substage 2 but also the idea that meeting individual needs involves an interaction between instructor and learner in which monitoring and feedback help shape adjustments in student teacher's instruction.

Table 4.4 provides a distribution of the ratings for level of problem representation during the first half of the practicum experience (Week 4).

By the fourth week of the practicum, all of the student teachers had moved beyond a sensorimotor stage, substage 3 level of problem representation. The reality of adapting real instruction to real individual differences among real learners in the real classroom

clustered student teachers' responses in the interrelational and dimensional stages of problem representation.

Table 4.4: Frequency Table for Levels of Problem Representation (PR) During the First Half (4th Week) of the Practicum

	PR Level*	Frequency (n=39)	Percent
Sensorimotor			
3	0	0	00.0
Interrelational	1	5	12.8
2	2	4	10.3
3	3	10	25.6
Dimensional	4	12	30.8
2	5	5	12.8
3	6	3	7.7
Vectorial	7	0	00.0

*Lowest to Highest Levels of Problem Representation

Of the total number of student teachers (n=39), 5 or 12.8% of student teachers' responses were at a lower level, interrelational stage, substage 1 of problem representation. The following is an example of this lower level of problem representation at the interrelational stage, substage 1:

The class' responsiveness to answering questions. I picked on certain nonresponsive students with questions I knew they could answer (See Appendix A, Question 4b; See Table 4.1, Subject #125).

In this response, the student teacher focuses exclusively on the class' reaction to her instruction. She is unable to identify or describe individual differences among learners and her solution is a global one directed at class members rather than the individual differences among learners in that class.

Of the total number of student teachers (n=39), the largest number of the group of student teachers was clustered around the transition point between interrelational stage and dimensional stages. Ten or 25.6% of the student teachers' responses were at the interrelational stage, substage 3. The following is an example of an interrelational stage, substage 3 response:

With this particular group of pupils, behavioral problems have been the most important individual difference to take into account. While teaching lessons, constantly it has been the same individual who is off task. Setting rules and expectations for off task behavior has reduced the number of interruptions during lessons (See Appendix A, Question 4b; See Table 4.1, Subject #003).

The student teacher is able to identify the index of individual difference: behavioral problems, yet he does not describe the range of the behavioral problem or its complexity. The student teachers' solution of setting rules and expectations for off task behavior attempts to

address the individual difference of the learner, but it is directed at all the learners in the class rather than one learner in particular.

By contrast, of the total number of student teachers (n=39), 12 or 30.8% were at the dimensional stage, substage 1, a stage in which student teachers are able to represent individual differences among learners as a category or dimension. The following is an example of the qualitatively different dimensional stage, substage 1 response:

Some are more willing than others to try new ideas and challenges while others are afraid of being wrong. It is important to reassure the students and offer encouragement and reinforcement. They need to be encouraged as much as possible since most of them suffer from low self-esteem to begin with (See Appendix A, Question 4b; See Table 4.1, Subject #045).

At this higher level of problem representation, the student teacher is able to coordinate an identification of an individual difference: self-esteem with the range of individual difference: some are more willing to try new ideas while others are afraid of being wrong. The solution is a general one directed at the low self-esteem group rather than tailored to the self-esteem needs of each individual learner.

Faced with the realities of the classroom, the student teacher who was identified at the vectorial stage, substage 1 level of problem representation retreated down a stage to the dimensional stage, substage 3. None of the student teachers' responses reflect a vectorial stage, substage 1, high level of problem representation during the first half of the practicum experience.

Table 4.5 provides a distribution of the student teachers' levels of problem representation during the second half of the practicum experience.

Table 4.5: Frequency Table for Levels of Problem Representation (PR) During the Second Half (9th Week) of the Practicum

	PR Level*	Frequency (n=39)	Percent
Sensorimotor			
3	0	0	00.0
Interrelational			
2	1	1	2.6
2	2	1	2.6
3	3	11	28.2
Dimensional			
2	4	13	33.3
2	5	8	20.5
3	6	1	2.6
Vectorial			
	7	4	10.3

*Lowest to Highest Levels of Problem Representation

By the ninth week of the practicum experience, none

of the student teachers' level of problem representation was at the lowest sensorimotor stage, substage 3, and only two student teachers' were rated at the lower interrelational stage, substages 1 and 2 levels of problem representation. Of the total number of student teachers ($n=39$), 11 or 28.2% of the student teachers' responses were at the interrelational stage, substage 3 while 13 or 33.3% were at the dimensional stage, substage 1. This finding suggests that the majority of student teachers in the sample were wrestling with the movement from a representation of the problem as one concerned with people and actions to one concerned with categories of relations or dimensions by the ninth week of the practicum. They were able to identify an index of individual difference in one learner while focusing on the class of learners, yet only some were able to coordinate this with a description of the range or dimension of that individual difference.

Of the total number of student teachers ($n=39$), 8 or 20.5% of the student teachers' responses were at the dimensional stage, substage 2 level of problem representation. The following is an example of a dimensional stage, substage 2 level response:

Our class has students who have very poor work habits and language skills as well as some superachievers. Addressing individual needs has been a challenge. One attempt was to provide underachievers with more responsibility in areas of school they enjoy (ie. PE or Science) and try to have these students use these experiences and responsibilities for written work or math See Appendix A, Question 4b; See Table 4.1, Subject 018).

At this higher level of problem representation, the student teacher focuses on the range and complexity of the index of individual difference while still addressing the needs of the class as a whole. The solution offered here is directed at a subgroup of learners, in this case underachievers rather than individual underachievers, yet the solution does take into account areas which are of interest to these underachievers.

Four or 10.3% of the student teachers' responses were at the vectorial stage, substage 1 level of problem representation. The following is an example of a vectorial stage, substage 1 response:

The different levels within the groups of student within creative writing. It is not the same problem with students in their writing. It is either punctuation, spelling, capitals, or omissions. That makes it hard for me as a student teacher to handle all these difficult concerns and problems with a class of 30 different individuals. I find that when the students are doing creative writing I talk to each individual or group of

individuals who are having problems with the same element of writing. By giving each individual a thing to look at and to be aware of in their own writing.. See Appendix A, Question 4b; see Table 4.1, Subject #111).

At this highest level of problem representation found in the sample, the student teacher is able to adapt her instruction to the needs of the individual learner. Her solution is arrived at through adjustments in her actions, expectations due to monitoring of and feedback from the individual learner.

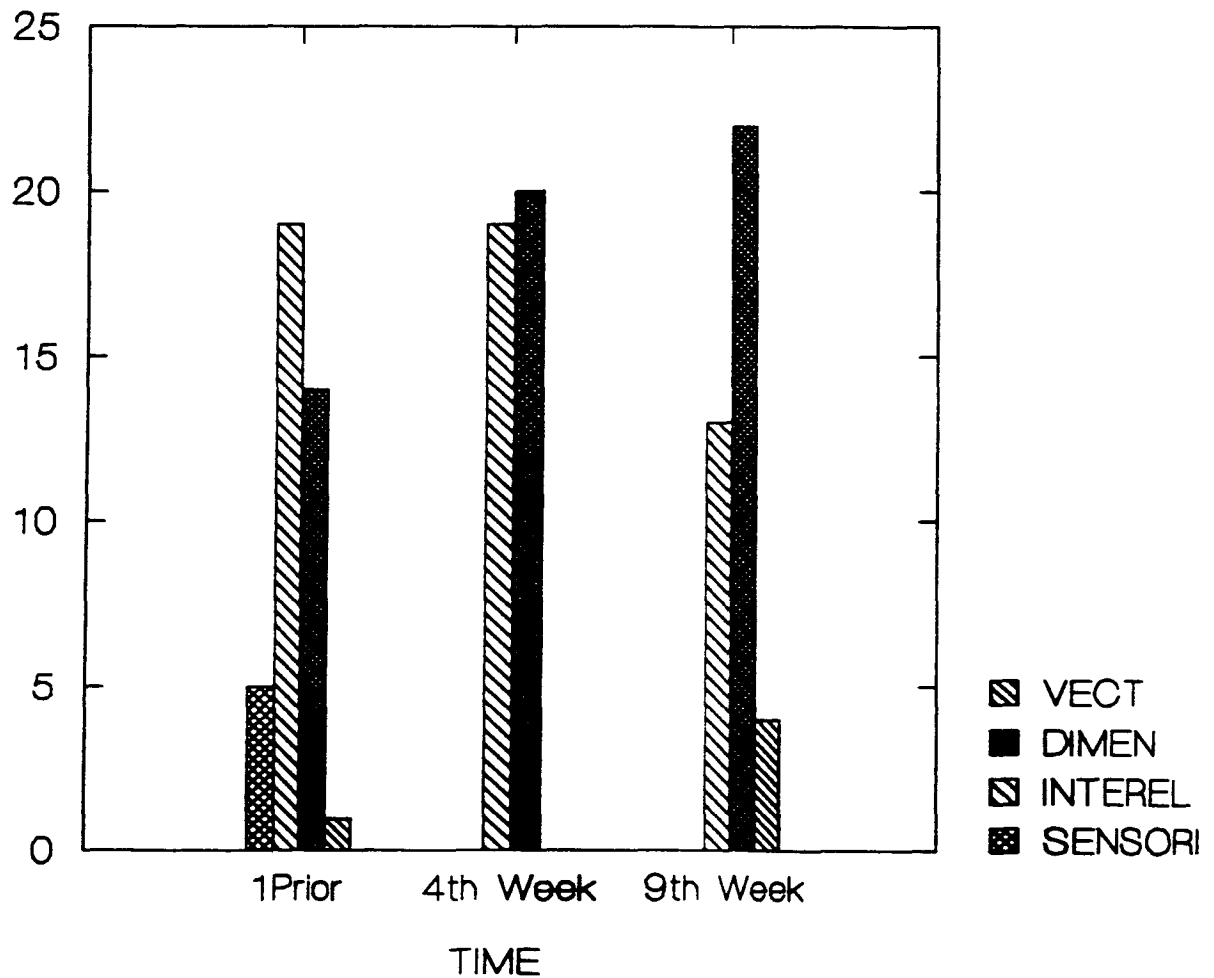
Figure 4.1 provides a graphic summary of the frequency distributions associated with the shifts in levels of problem representation over the course of the practicum experience.

2. Student Teachers' Description of the Problem Representation

In order to explore the nature of student teachers' problem representation, student teachers were asked to: "Describe the most difficult problem you had adapting your teaching to individual differences among your pupils. What steps did you take to resolve this problem?" at the fourth and ninth weeks of the practicum experience. Student Teachers' responses to this question

will be examined in terms of presence of the three components which constitute Case's (1985, 1991) control structure:

Figure 4.1: Graphic Summary of the Frequency Distributions Associated with the Student Teachers' Levels of Problem Representation Prior to, During the First and Second Halves of the Practicum



representation of the problem situation, representation of objectives, and representation of strategy or strategies employed. The number of aspects of each of these three components will be noted. Responses were rated according to the presence of components and the number of aspects of these components of problem representation (See Chapter 3 for a description of the representation of the problem). Table 4.6 provides a distribution of the ratings for the description of problem representation during the first half of the practicum experience.

Table 4.6: Frequency Table for the Student Teachers' Description of the Problem Representation During the 4th Week of the Practicum

# of Aspects*	Problem Situation		Problem Objective		Problem Strategy	
	F	%	F	%	F	%
0	0	00.0	14	35.9	3	7.7
1	3	7.7	24	61.5	12	30.8
2	19	48.7	1	2.6	14	35.9
3	10	25.6	0	00.0	8	20.5
4	6	15.4	0	00.0	2	5.1
5	1	2.6	0	00.0	0	00.0

*Least to Largest number of aspects noted

During the first half of the practicum experience, the two components: representation of the problem

situation and representation of the problem strategy were present in all student teachers' descriptions of their representation of the individual differences problem. Of the total number of student teachers ($n=39$), 14 or 35.9% did not explicitly state a representation of the problem objective in their description. Twenty-four or 61.5% of the student teachers were only able to give a description of one objective in their representation of the problem.

As indicated in Table 4.7 above, the majority of student teachers' representations of the problem situation component of the individual difference problem featured two aspects whereas their representations of the problem strategies component consisted of one or two aspects. The following is an example of a lower level description of the components of problem representation:

I haven't had to adapt on the whole, I just make sure that the students I feel to be slower get ample time to answer the questions (See Appendix A, Question 4a; See Table 4.2, Subject #114).

In the student teacher's representation of his most difficult problem during the first half of the practicum, his representation of the problem situation contains only one aspect; no problem objective is represented, and his representation of the problem strategy contains only one

aspect.

By contrast, the following example of a higher level of description of components of problem representation suggests a more detailed representation of problem situation, objective(s), and strategy:

We have a number of ESL (Iranian) students in the class. Some don't understand a word of English (or very few words) and can't write. Others are "dying" to learn and pretend to understand the directions when they really can't. Therefore, I had to make sure that all my lessons were directed at everyone, but especially more so to them (See Appendix A, Question 4a; See Table 4.2, Subject #158).

This student teacher's representation of his most difficult problem contains a detailed description of at least four aspects of the problem situation. He describes an objective for his instruction: to make sure all lessons were directed at everyone. His strategy for implementing this objective involves two aspects: planning instruction to accommodate all levels of prior knowledge especially the varying levels of ESL students in his class.

Table 4.7 provides a distribution of student teacher's description of the problem representation during the second half of the practicum experience.

Table 4.7: Frequency Table for the Student Teachers' Description of the Problem Representation During the 9th Week of the Practicum

# of Aspects*	Problem Situation		Problem Objective		Problem Strategy	
	F	%	F	%	F	%
0	0	00.0	14	35.9	2	5.1
1	2	5.1	24	61.5	12	30.8
2	14	35.9	1	2.6	10	25.6
3	15	38.5	0	00.0	10	25.6
4	6	15.4	0	00.0	3	7.7
5	2	5.1	0	00.0	2	5.1

*Least to Highest Number of Aspects Noted.

By the second half or ninth week of the practicum, the majority of student teachers' representations of the problem situation component increased to three aspects. Their representations of the strategy employed to move from the problem situation to the desired situation ranged from one to three aspects. No change was reflected in the student teachers' representations of their objectives when faced with a problem situation. Of the total number of student teachers ($n=39$), 24 or 61.5% still represented only one aspect in their description of the representation of the problem objective. This result suggests that student teachers may still have difficulty representing the problem objective component of a

difficult problem even by the second half of the practicum experience.

3. Faculty Supervisors' Ratings and Observations

The faculty supervisors' ratings and observations were designed to provide a means of triangulation to check on how well student teachers were able to translate their representations of the problem of individual differences into action during the practicum experience. Faculty supervisors' ratings were scored along a 7 point Likert scale which represented a continuum from low to high levels of accommodation of individual differences (See Chapter 3, Table 3.2 for a detailed description of ratings and observations). The following Table 4.8 provides a distribution of the supervisors' ratings of how well student teachers accommodated individual differences during the first half or fourth week of the practicum experience.

The majority of student teachers (n=28), 8 or 20.5% were rated as a four and 12 or 30.8% were rated as a five representing a mid level of accommodation.

Table 4.8: Frequency Table for Supervisors' Ratings of Student Teachers' Accommodation of Individual Differences During the First Half (4th week) of the Practicum

	Rating	Frequency (n=39)	Percent
Minimal			
Accommodation	1	2	5.1
	2	5	12.8
	3	3	7.7
Mid	4	8	20.5
Accommodation	5	12	30.8
	6	5	12.8
Considerable	7	4	10.3
Accommodation			

Typically, such accommodation of individual differences included recognition of at least one index of individual difference among learners and at least one strategy which involved some individualization of instruction to accommodate individual learner's or subgroup's of learners needs.

Table 4.9 provides a distribution of the supervisors' ratings of student teachers' accommodation of individual differences during the second half or ninth week of the practicum experience. By the second half of the practicum, all student teachers were observed to progress beyond the lowest level of minimal accommodation of individual differences.

Table 4.9: Frequency Table for Supervisors' Ratings of Student Teachers' Accommodation of Individual Differences During the Second Half (9th Week) of the Practicum

	Rating	Frequency (n=39)	Percent
Minimal			
Accommodation	1	0	00.0
	2	4	10.3
	3	4	10.3
Mid	4	8	20.5
Accommodation	5	7	17.9
	6	14	35.9
Considerable	7	2	5.1
Accommodation			

The majority of student teachers, 14 or 35.9% of the total number of student teachers (n=39) were rated as a six, a higher level of accommodation. At this level, faculty supervisors reported that individual needs shaped the learning activities and student teachers used monitoring and feedback as a means to identify and meet individual differences among learners.

B. SECONDARY ANALYSIS

The nature of individual differences noted by student teachers and faculty supervisors in all of their responses to the questionnaires represents their

perspectives on what constitutes an individual difference and the types or aspects of individual differences which must be adapted to during instruction. A full description of the codes for the types of individual differences is included in Appendix C. A brief summary of these types of individual differences appears in Figure 4.2.

Figure 4.2: A Summary of The Types of Individual Differences Noted by Student Teachers

0	=	unable to identify a type of individual difference
1	=	learning rates
2	=	general intellectual and academic ability
3	=	specific skill or aptitude or ability
4	=	prior knowledge ie. ESL
5	=	specific interest areas
6	=	general motivational levels
7	=	ethnic or cultural background
8	=	behavioral differences
9	=	learning styles
10	=	attentional differences
11	=	maturity levels
12	=	social skills
13	=	socio economic status, social background
14	=	personality characteristics, self-esteem
15	=	general category/ all individual differences
16	=	physical or motor differences

Table 4.10 provides a distribution of the ratings of individual differences noted by student teachers in their definitions of individual differences and their descriptions of their most difficult problems encountered

during the fourth and ninth weeks of the practicum.

Table 4.10: Frequency Table for Aspects of Individual Differences Noted by Student Teachers in Definition (Question 7a) and Most Difficult Problem (Question 4a, 9a) During the Practicum

Types of Individual Differences*	Prior Defn		4th Week Difficult Problem		9th Week Difficult Problem	
	F	%	F	%	F	%
0	2	5.1	0	00.0	1	2.6
1	9	23.1	10	25.6	9	23.1
2	7	17.9	15	38.5	21	53.8
3	2	5.1	2	5.1	1	2.6
4	3	7.7	5	12.8	4	10.3
6	2	5.1	0	00.0	1	2.6
7	1	2.6	0	00.0	0	00.0
8	1	2.6	6	15.4	2	5.1
9	4	10.3	0	00.0	0	00.0
10	0	00.0	1	2.6	0	00.0
11	1	2.6	0	00.0	0	00.0
12	2	5.1	0	00.0	0	00.0
13	3	7.7	0	00.0	0	00.0
15	1	2.6	0	00.0	0	00.0
16	1	2.6	0	00.0	0	00.0

As a group, student teachers alluded to a wide variety of individual difference types (16). Learning rates were mentioned most often in student teachers definition of individual differences followed by general intellectual and academic ability and learning styles.

When asked to describe a difficult individual differences problem they were experiencing during the

first half of the practicum, the variety of individual differences in student teachers' responses narrowed to six types. General intellectual and academic ability was the area of individual difference in which student teachers experienced their most difficult problem followed by learning rates and behavioral differences.

By the second half of the practicum, the variety of individual difference types increased to seven. General intellectual and academic ability was still the individual difference type cited most often by student teachers followed by learning rates. By the ninth week, however, the individual difference of prior knowledge was of more concern than behavioral differences. This result may indicate that by the second half of the practicum, student teachers' focus has shifted away from behavioral differences and classroom management issues and on to the aspects of individual differences which the learner brings to the learning enterprise. Table 4.11 provides a distribution of the ratings of individual differences noted by student teachers in their response to "What aspects of differences are most likely to be problematic for teaching" (Question 7b) and "What have been the most important individual differences to take into account

when teaching this group of pupils?" (Questions 4b,9b)

Table 4.11: Frequency Table for Aspects of Individual Differences Noted by Student Teachers in Questions 7b, 4b, 9b During the Practicum

Types of Individual Differences*	Prior Defn		4th Week Difficult Problem		9th Week Difficult Problem	
	F	%	F	%	F	%
0	8	20.5	2	5.1	2	5.1
1	5	12.8	2	5.1	5	12.8
2	7	17.9	12	30.8	10	25.6
3	3	7.7	8	20.5	10	25.6
4	0	00.0	4	10.3	2	5.1
5	1	2.6	0	00.0	0	00.0
6	2	5.1	2	5.1	2	5.1
8	4	10.3	1	2.6	3	7.7
9	5	12.8	1	2.6	3	7.7
10	0	00.0	1	2.6	0	00.0
12	1	2.6	2	5.1	0	00.0
13	2	5.1	2	5.1	0	00.0
14	1	2.6	1	2.6	4	10.3
15	0	00.0	1	2.6	0	00.0

The variety of individual difference types noted by student teachers in their definition of individual differences narrowed to ten when student teachers were asked what aspects of individual differences would likely be problematic for teaching prior to the practicum. General intellectual and academic ability were mentioned most often by student teachers followed by equal mention of both learning rates and learning styles, then prior knowledge. During the first half of the practicum,

general intellectual and academic ability continued to be alluded to most often by student teachers followed by specific aptitudes and skills and then prior knowledge. By the second half of the practicum, the pattern continued in that student teachers still showed the most concern for general intellectual and academic abilities, yet specific aptitude and skill became of equal concern to student teachers. General motivational level became the second area of individual differences most noted by student teachers edging out learning rates which were allocated to a third position. This pattern may reflect the student teachers' growing ability to adapt their instruction to individual differences. The learners' motivation levels become more important as the practicum enters its ninth week and the novelty of a different teacher wears off among learners. A parallel pattern of types of individual difference emerged in the faculty supervisors' observations of the student teachers during the practicum experience. Table 4.12 provides a distribution of the ratings of individual differences noted by faculty supervisors in their observations of student teachers' accommodation of individual differences during the fourth and ninth weeks of the practicum.

Table 4.12: Frequency Table for Aspects of Individual Differences Noted by Faculty Supervisors in Their Observations of Student Teachers During the 4th and 9th Weeks of the Practicum

Aspects of Individual Differences*	4th Week		9th Week	
	Frequency	Percent	Frequency	Percent
0	8	20.5	7	17.9
1	2	5.1	4	10.3
2	8	20.5	8	20.5
4	4	10.3	3	7.7
5	6	15.4	1	2.6
6	2	5.1	6	15.4
8	1	2.6	3	7.7
9	2	5.1	3	7.7
14	4	10.3	4	10.3
16	1	2.6	0	00.0

Similar to the student teachers, faculty supervisors mentioned general intellectual and academic ability most often at both the fourth and ninth weeks of the practicum. During the first half of the practicum, faculty supervisors' observations noted student teachers' attempts to accommodate individual differences in the area of learners' specific interest areas followed by prior knowledge. This finding indicates student teachers' concern with the individual difference of prior knowledge during the first half of the practicum.

By the ninth week of the practicum, faculty

supervisors' observations noted student teachers' attempts to meet general motivational levels in their learners. Both learning rates and personality characteristics were the types of individual difference mentioned third most often by faculty supervisors. This finding shows that student teachers were observed to adapt their instruction to types of individual difference which were affective in nature not just cognitively oriented. This suggests that student teachers were beginning to address the individual differences of the whole child, not just the academic component.

In summary, the types of individual difference noted most often by student teachers and faculty supervisors were general intellectual and academic ability and learning rates. Prior to the practicum experience, student teachers noted a wide variety of individual differences. Over the course of the practicum experience, student teachers' focus on individual difference types broadened from a cognitive emphasis to one which included affective components. This change of focus was also reflected in the types of individual difference noted by faculty supervisors' observations of

how student teachers accommodated individual differences in their instruction.

These data were used to explore and to generate questions about student teachers' representations of real life teaching problems and the ways in which those representations change during the practicum experience based on the results discussed in this chapter. Further discussion of the results as they apply to the formulation of questions, the evaluation of Case's neo-Piagetian conceptual framework as a theoretical tool, and the implications of these questions and theoretical perspective for research on teacher education, student teacher thinking, and reflective practice will be presented in Chapter Five. In addition, the limitations of the study and directions for future research will be discussed.

CHAPTER V: DISCUSSION

This study was designed to explore how student teachers represent the problem of adapting instruction to individual differences among learners and how this ability develops over the course of the practicum experience. The extent to which Case's (1985, 1991) neo-Piagetian theory of intellectual development may provide a theoretical framework for conceptualizing student teachers' representations of the problem of individual differences was also investigated. These questions were formulated from research on teacher education, teachers' thought processes, and reflective practice.

The major purpose of the study was to provide a conceptual framework from which questions designed to elucidate student teachers' representation of the problem of adapting instruction to individual differences among learners, could be delineated and further analyzed. The results and limitations of the study contribute to the implications of and generation of future research questions on teacher education, student teacher thinking, and reflective practice.

A. DISCUSSION OF THE RESULTS

1. Student Teachers' Level of Problem Representation

Student teachers' responses to the question: "What aspects of individual differences are likely to be problematic for your teaching?" prior to the practicum provided a means to explore their representations of the individual differences problem. Results from the present study indicate that prior to the practicum student teachers' levels of problem representation ranged from the lowest sensorimotor stage, substage 3 to the higher vectorial stage, substage 1. This finding suggests that student teachers begin at the point at which they are in their thinking about the individual difference problem, not all at the same starting point or where researchers and teacher educators think they "ought" to begin. Although 5 or 12.8% of student teachers did begin at the sensorimotor stage, substage 3, the majority of student teachers (19 or 48.7%) started at the low interrelational stage in their level of problem representation. This finding suggests that these student teachers had some sense of what a class of learners was like and how instruction unfolds, but their attention was focused on groups of people and their actions rather than categories

of relations or dimensions of individual difference typical of the dimensional stage. Another group of student teachers, 14 or 35.8% were able to identify the range and complexity associated with the individual differences problem and showed levels of problem representation at the dimensional stage.

By the fourth week of the practicum, all of the student teachers had moved beyond a sensorimotor stage, substage 3 level of problem representation. Faced with the realities of adapting instruction to real learners' individual differences, the majority of student teachers' levels of problem representation were clustered in the interrelational (19 or 48.7%) or dimensional (20 or 51.3%) stages. The student teacher who showed a vectorial stage, substage 1 level of problem representation prior to the practicum, succumbed to the time pressures of the practicum experience and retreated to the dimensional stage. Typically, this pattern of retreating to a previous substage of problem representation when faced with the uncertainties of real teaching situations affected 12 or 30.7% of student teachers.

By the ninth week of the practicum, of the majority

of student teachers 22 or 56.4% showed a dimensional stage level of problem representation. This finding suggested a qualitative shift in student teachers' representation of the individual differences problem from one concerned with people and actions to one concerned with categories of relations or dimensions. Of 13 or 33.4% of student teachers at the interrelational stage, 11 or 28.2% were at substage 3. Such a finding indicates that these student teachers were able to identify an individual difference while instructing the class, but were unable to coordinate this with a description of the range or dimension of that individual difference. Four or 10.3% of student teachers were able to represent the problem of individual differences at the higher vectorial stage, substage 1 level. This suggests an ability to adapt instruction to the needs of the learner which involved adjustments in the student teachers' actions and expectations arrived at through monitoring and feedback. By the ninth week of the practicum, 6 or 50% of the subgroup of 12 student teachers whose levels of problem representation retreated a substage, actually recovered reflecting a U shaped pattern very similar to the pattern Turiel (1969) found in the results he used to support his

idea of stage 4.5 "transitions".

Faculty supervisor ratings and observations on how well student teachers accommodated individual differences among learners paralleled student teachers' growing abilities to represent the problem of individual differences in more complex ways. At the fourth week of the practicum, the majority of student teachers (12 or 30.8%) were given a rating of 5 on a 7 point Likert scale. By the ninth week, the majority (14 or 35.9%) were given a rating of 6. All student teachers were observed to progress beyond the lowest levels of minimal accommodation of individual differences by the second half of the practicum.

These results taken together with the student teachers' description of the components of problem representation which will be discussed next, provide a rich and detailed picture of how student teachers ability to think about the real teaching problem of adapting instruction to individual differences among learners develops during the practicum.

2. Student Teachers' Description of Problem Representation

When asked to describe the most difficult problem

they had adapting their teaching to individual differences among learners at the fourth and ninth weeks of the practicum, the majority of student teachers' responses reflected the presence of all three components of problem representation. The complexity of student teachers' descriptions of problem situation and problem strategy components increased during the practicum from 1 or 2 aspects to 2 or 3. Student teachers' descriptions of the problem objective component remained unchanged over the practicum. In fact, 14 or 35.9% of the student teachers' responses did not include an explicit statement of problem objective. The majority of student teachers (24 or 61.5%) were able to describe one aspect of the problem objective. These findings suggest that student teachers may still have difficulty representing the problem objectives component of a difficulty problem even by the second half of the practicum experience.

An additional analysis of the types of individual differences noted by student teachers and faculty supervisors in their questionnaire responses reflected that general intellectual and academic ability as well as learning rates were the individual differences most often noted. Over the course of the practicum experience,

student teachers' focus on individual difference types broadened from a cognitive emphasis to one which included affective components. This change of focus was also reflected in the types of individual differences noted by faculty supervisors in their observations of student teachers. It parallels to some extent student teachers' growing ability to identify and meet the needs of individual differences among their learners

Student teachers' ability to note individual differences which describe the whole child, their ability to describe more aspects of the problem situation and strategy components of problem representation, and their progression beyond a sensorimotor stage, substage 3 level of problem representation to levels of problem representation primarily at the interrelational substage 3 and dimensional substages suggest a growth in their ability to represent the problem of individual differences. These findings are expected given Case's view of development in which experience plays an important role in the hierarchical integration of cognitive structures. Evidence of the increasing complexity of student teachers' level and description of problem representation during the practicum indicates the

importance of the role of experience and reflection on experience in student teacher development. In addition, this evidence suggests that Case's model with its emphasis on the role of experience is an appropriate conceptual framework to describe the development of the student teachers' ability to represent real life teaching problems.

3. Case's Neo-Piagetian Perspective as a Conceptual Framework for Thinking About Student Teachers' Representation of Real Life Teaching Problems

One of the purposes of the present study was to investigate whether or not the structures and processes of Case's (1985, 1987, 1991) neo-Piagetian theory of intellectual development could provide an adequate theoretical means to describe the development of student teachers' ability to represent real life teaching problems. Case's model has provided a rich set of categories to describe the shifts occurring across the levels of student teachers' problem representation during the practicum. The findings were consistent with basic principles of Case's theory and his emphasis on the contribution of environmental factors and experience. The finding that student teachers' initial levels of

problem representation ranged from lowest sensorimotor stage, substage 3 to higher vectorial stage, substage 1 levels further supports the use of a perspective which embraces a constructivist approach. Case's neo-Piagetian theory provides a means of assessing where the student is in their representation of real life teaching problems rather than where researchers and teacher educators think the student teacher "ought to be".

The findings of the present study are consistent with findings reported by Ammon and Hutcheson (1989) in the use of their five levels to represent the structural stages in the domain of developmental pedagogy. They found that the majority of student teachers attained median levels of pedagogical conception while few teachers aspired to the higher levels. Although Ammon and Hutcheson (1989) do not specify the structures and processes which account for the student teachers' movement from level to level, their findings are compatible with the results of the present study. Such a parallel suggests that Case's neo-Piagetian perspective may be an appropriate theoretical tool to conceptualize student teachers' representations of real life teaching problems.

As an exploratory, first step, the present study provided a useful set of categories from which student teachers' levels and complexity of representation of the individual differences problem could be described. The refinement of these categories together with the development of a set of scenarios which address other real life teaching problems to test student teachers' levels of problem representation represent the next steps in research which uses Case's neo-Piagetian conceptual framework. The present study provides support for a conceptual framework which does have the potential to provide a theoretical basis for research in teacher education, teacher thinking, and reflective practice which investigates the process of becoming a teacher.

B. LIMITATIONS OF THE STUDY

Several methodological issues including the generalizability of the results, the verbal protocols as a measure of student teacher thinking, and the conclusions which can be drawn from the results require careful consideration.

The present study was exploratory only. Its intention was to generate questions based on the

development of a framework for student teacher thinking which combines several research traditions. The traditions are cognitive development, teachers' thought processes and reflective thinking. The sample for the present study was made up of a total of 39 student teachers completing the final thirteen week practicum of the two year teacher education program and 12 faculty supervisors. Participants were not randomly selected, therefore, generalizations to other student teachers and to other teacher education programs must be considered with caution. Although the size of the sample was adequate for the exploratory nature of the study, the number of student teachers within each substage of the levels of problem representation varied. Only six student teachers were rated at the sensorimotor level of problem representation. Similarly, only five student teachers were rated at the vectorial level of problem representation. Therefore, the effect of student teachers' experience over the course of the practicum on level of problem representation should be interpreted with caution.

The use of questionnaires to stimulate student teachers' thinking about the nature of individual

differences and the adaption of their teaching to individual differences among learners gives rise to several methodological concerns. The three sets of two questions asked prior to, and at the fourth and ninth weeks of the practicum experience represented a way of stimulating thought processes associated with the representation of the individual differences problem and provided opportunities for student teachers to reveal their own thinking about this real life teaching problem. Anomalies in the student teachers' responses may be due to the time pressures experienced over the course of the practicum experience. Prior to the practicum, student teachers gave well articulated, lengthy responses to the questions asked of them. At the fourth week of the practicum, responses ranged from a few words to a couple of hurried sentences. By the ninth week, responses increased in length to a couple of sentences to detailed paragraphs. The amount of time spent on the questionnaires appeared to vary for this reason and may account in part for the U shaped pattern of response described above. Although the use of questionnaires does not achieve the quality of responses and explanations that are elicited in a clinical method within an

interview setting, factors such as cost, time, economy of administration and the exploratory nature of the study influenced the method employed.

Task scenarios rather than questionnaires coupled with clinical interviews which probe for information based on teacher's immediate reactions to questions may provide a standardized way for controlling variations which seem to arise due to the flexibility of time given to complete the questionnaires. More importantly, the opportunity for the interviewer to elicit continuous responses from each student teacher will help to determine how the student teacher is interpreting the question posed as well as how he/she is thinking about the task. In this situation, the interviewer is able to ask as many questions deemed necessary in order to elicit the student teacher's representation of the problem.

Although the methodology of the present study used triangulation in a blend of process tracing and ethnographic methods of inquiry, anomalies in the faculty supervisors' ratings and the observations they gave on how well student teachers accommodated individual differences among learners in their instruction were apparent. For example, some faculty supervisors rated

student teachers as a 6 or 7 (considerable accommodation) on the 7 point Likert scale while citing examples of accommodation which reflected only moderate accommodation and median level of problem representation. A question in the faculty supervisor's questionnaire which assessed the faculty supervisor's definition of individual differences and the aspects of individual differences which they deem to be problematic for teaching may have shed some light on these anomalies. The extent to which the student teacher reflects on his own construction of the problem of adapting instruction to individual differences, formulates his own strategies for dealing with the problem based on his representation, and then uses this representation in the classroom setting could better be established through classroom observation which employs observers versed in Case's neo-Piagetian conceptual framework.

In the present study, the suggestion is that student teachers who have a higher level of problem representation and a more detailed description of the problem may have the thought processes and pedagogical knowledge available to them for organizing and reflecting-in-action on their own problem representations

within the practice setting. The extent to which student teachers reflect on their "knowledge-in-action" may depend on the representations they have available to them. Evidence for this may best be established through clinical interview techniques augmented by careful classroom observation.

Despite these limitations, several implications and questions for future research student teachers' thought processes emerged from the findings. These will now be discussed.

C. IMPLICATIONS FOR RESEARCH ON TEACHING

Studies of teachers' thought processes have focused on identification, frequency counts, and antecedents of teachers' interactive thoughts (see Clark & Peterson, 1986 for a review). Such a narrow focus of research has yielded little about how teachers actually make interactive decisions or how they begin to construct and reconstruct more adequate conceptions of pedagogical knowledge. What these researchers neglect to consider are the implications of a developmental perspective for studies of teacher thinking. Within a constructivist framework of growth in knowledge, researchers have the opportunity to examine how student teachers think about

teaching and learning. The student teacher's own experiences and actions, and the cognitive developmental processes which may be associated with his ability to think about teaching from a developmental perspective, may provide researchers with insight into the student teacher's own "reflection-in-action". The use of a neo-Piagetian conceptual framework may provide a rich theoretical tool for further research on teacher thinking and for the development of teacher education programs for student teachers.

If researchers begin to study the student teacher's representations of real life teaching problems from a theoretical perspective which can yield a fine grained analysis of the underlying structures and processes available to student teachers as they construct their own representations of the problems they confront in the classroom, then they may begin to understand "how" and "why" student teachers develop the ability to teach. If researchers ask questions about the student teacher's own level of problem representation, then they may begin to match teacher education curriculum to the needs of the student teachers. If they begin to observe student teachers in the act of teaching, then they may be in a

better position to describe the growth of problem representation, pedagogical knowledge, and reflection-in-action which occurs as student teachers engage in the teaching process. They may also be in a better position to address the theory/ practice dichotomy which characterizes the curricula of our present teacher education programs. In this view, teacher education will begin where the student teacher is rather than on where researchers and teacher educators think the student teacher "ought to be". What the present study may offer the researcher and teacher educator is a developmental perspective and a conceptual framework for identifying the underlying structures and processes which characterize the student teacher's level and complexity of problem representation when he is faced with real life classroom problems which may be defined as ill-defined problems.

D. DIRECTIONS FOR FUTURE RESEARCH

The intent of the present study was to generate questions based on an exploration of the ways in which student teachers represent the problem of adapting instruction to individual differences and the ways in

which their representations change over the course of the practicum. As a result of the findings, several questions were generated to stimulate further research on, student teachers' representations of real life teaching problems from a neo-Piagetian perspective.

These questions are:

1. To what extent do the level and complexity of student teachers' problem representations predict success in dealing with the uncertainties of the classroom?
2. To what extent do cross-domain parallels exist between student teachers' level of problem representation in the domain of teaching and in the scientific, social, and spatial domains?
3. When faced with classroom situations which may be described as ill-defined problems to what extent do student teachers:
 - a. select information from their pedagogical knowledge base, repertoire of experiences and actions to formulate representations of the problem?
 - b. formulate alternative representations of the problem?
 - c. formulate representations of the problem based on their hypotheses about how the students are thinking?
 - d. formulate their own theories of teaching and learning as they formulate representations of the problem?
4. What sorts of problems and tasks in the domain of teaching can be modelled by Case's neo-Piagetian conceptual framework?

5. Can both conceptual and procedural aspects of the complex task of teaching be modelled by Case's neo-Piagetian conceptual framework?
6. To what extent is a conceptual structure a necessary prerequisite for success in the process of learning how to teach?
7. To what extent can student teachers be helped to bridge the gap between their present level of problem representation and the next level prior to, and during the first and second halves of the practicum experience?
8. Is the vectorial stage of problem representation obtained by the majority of student teachers only if special provision is made for experience which allows for that level of hierarchical integration?

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APPENDIX A

Student Teacher and Faculty Supervisor
Questionnaires

Pre-Practicum

7a. What is your definition of individual differences among pupils? Which aspects of individual differences will likely have the most impact on the way that you teach during the practicum?

7b. What aspects of individual differences do you think are likely to be problematic for teaching. Why?

Practicum First Half

139

Week 4 Name _____

4a. Describe the most difficult problem you have had in adapting your teaching to individual differences among your pupils during these first weeks. What steps did you take to resolve this problem?

4b. What have been the most important individual differences to take into account when teaching this particular group of pupils? Give an example of an attempt to meet these differences that you were most satisfied with.

Practicum Second Half

140

Week 9 Name _____

9a. Describe the most difficult problem you have had in adapting your teaching to individual differences among your pupils during these past five weeks. What steps did you take to resolve this problem?

9b. What have been the most important individual differences to take into account when teaching this particular group of pupils? Give an example of an attempt to meet these differences that you were most satisfied with.

UBC Supervisor First Half Practicum Weeks 1-7

_____ (Student teacher's first name, initial of last)

6a. How well has the student teacher been able to accommodate individual differences among learners?

1	2	3	4	5	6	7
Minimal			mid	Considerable		
Accommodation				Accommodation		

6b. Give one or more examples of how the student teacher accommodated individual difference among learners. Please do not use the same example(s) as for adjusting for fast and slow learners. Please mention the basis of the student teacher's accommodation (ability, motivation, interest, learning style, etc.).

UBC Supervisor Form Second Half, Weeks 8-12

_____ (Student teacher's first name, initial of last)

6a. How well has the student teacher been able to accommodate individual differences among learners?

1	2	3	4	5	6	7
Minimal			mid	Considerable		
Accommodation				Accommodation		

6b. Give one or more examples of how the student teacher accommodated individual difference among learners. Please do not use the same example(s) as for adjusting for fast and slow learners. Please mention the basis of the student teacher's accommodation (ability, motivation, interest, learning style, etc.). If you wish, you may note improvement (or lack of improvement) by comparison to the first seven weeks.

APPENDIX B

Description of the Two Year UBC Teacher Education Program

MAJOR FEATURES OF INITIAL TEACHER EDUCATION PROGRAMS AT UBC

The revised programs of Initial Teacher Education were first offered in September, 1987. Since then, some further modifications have been made each year. What follows is a summary of the major features of the programs as they are offered during 1991-92.

A. Overall program features

The minimum post-secondary preparation for beginning teachers, both elementary and secondary, is five years.

In order to provide adequate time for candidates to achieve an education with both breadth and depth, the pedagogical phase of initial teacher education presupposes the completion of a minimum of three years of post-secondary general education and subject studies. For secondary teachers a degree in the selected teaching field(s) is required.

In order to provide adequate time for candidates to acquire and assimilate the knowledge, skills, and attitudes necessary to begin a teaching career and to become accustomed to the standards and practices of the teaching profession, the pedagogical phase of initial teacher education extends over a minimum of 12 months.

B. General and subject-matter studies

- In order to prepare for the general nature of their future teaching responsibilities, all prospective teachers complete introductory or survey courses in English and in as many as possible of the major fields of human inquiry. Some studies should have a significantly Canadian content or approach. Where possible, the preparatory program includes both some introductory study of educational theory and practice (preferably including classroom contact) and also a second-level course in English composition or writing.
- Each prospective elementary teacher completes at least a one-term course related to each of the core subjects in the B.C. elementary school curriculum (mathematics, a laboratory science course, and courses in history and/or geography in addition to the English requirement noted above). In order for individual teachers to be an academic resource to their schools and communities, each teacher develops subject-matter strength in one selected elementary school subject. This consists of 18 credits (3 full courses) at the third or fourth year level in addition to introductory or survey courses in that subject.
- Secondary teacher candidates achieve depth of knowledge and understanding in at least one, and preferably two, secondary teaching subjects.

C. Pedagogical studies

- Initial teacher education includes a blend of pedagogical courses and experiences of a general character with others more focussed on the grades and subjects to be taught. Teaching methods courses encompass both general and subject-specific studies.
- Special attention is to be paid to the prospective teacher's communication skills, both oral and written and both verbal and non-verbal.
- The selected program of studies is tightly structured and sequenced with opportunity for some electives during the final term.

D. School experience

- In order to give candidates adequate opportunity to perfect their classroom skills, to establish and consolidate appropriate attitudes and behaviour patterns, and to enhance their professional confidence, the final practicum extends for a full term of 13 weeks.
- Prior to the extended practicum, school experience of different sorts is integrated with courses.
- Admission to any teaching practicum requires the completion of all liberal education and subject-matter requirements of the program. Admission to the extended practicum requires, in addition, the completion of all general and subject-specific teaching methods courses as well as other prescribed introductory pedagogy courses. Oral and written English screening tests must also be completed before the extended practicum.

The Elementary Teaching Program (2 years)

The basic program sequence

Year 1, Term 1

Prospective teachers are introduced to the theoretical bases of modern educational practice. Studies include analysis of the nature and objectives of education and of the developmental characteristics of learners. Attention is given to candidates' own interpersonal and communication skills and to strategies and methods of teaching. Structured classroom observations and teaching experiences (such as tutoring, peer teaching, and microteaching) are provided.

Education 310 (Principles of Teaching: Elementary)	6 credits
Reading Education 310	3 credits
(Introduction to Elementary Reading and Language Arts Instruction)	
Education 315 (Pre-Practicum Experience)	0 credits
Education 316 (Communication Skills in Teaching)	3 credits
Educational Psychology and Special Education 313	3 credits
(Educational Application of Developmental Theories)	
Educational Psychology and Special Education elective: one of:	
- Educational Psychology and Special Education 322	2 credits
(Education during the Early Childhood Years)	
- Educational Psychology and Special Education 323	2 credits
(Education during the Middle Childhood Years)	
Educational Studies 314 (Analysis of Education)	3 credits

Year 1, Term 2

This term includes an intensive two-week school placement in which candidates consolidate their understanding of instructional principles and approaches. This classroom experience provides a basis for further studies of ways of organizing knowledge for instruction and of methods and strategies for teaching. Elementary candidates will prepare to teach all subjects at specific grade levels.

Education 321 (Orientation School Experience: Elementary)	0 credits
Curriculum and Instruction Courses	
Art Education 320	2 credits
Education 320 (Physical Education)	2 credits
English Education 320	2 credits
Mathematics Education 320	2 credits
Music Education 320	2 credits
Reading Education 320	2 credits
Science Education 320	2 credits
Social Studies Education 320	2 credits

Year 2, Term 1

Candidates spend this term in selected B.C. elementary schools. Each candidate works closely with a team of experienced teachers who have been specially prepared for this supervisory and instructional responsibility. Faculty support, advice, and assessment are provided on a regular basis.

Education 418 (Extended Practicum: Elementary)	18 credits
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Year 2, Term 2

Following completion of the extended practicum, candidates undertake professional studies to put their teaching competence in a more comprehensive framework of knowledge and understanding. The term includes elective or prescribed studies appropriate to each candidate's personal academic and professional interests.

Education 420 (School Organization in its Social Context)	2 credits
Educational Psychology and Special Education 423	3 credits
(Learning, Measurement, and Teaching)	
Educational Studies elective: one of:	
- Educational Studies 425 (Educational Anthropology)	3 credits
- Educational Studies 426 (History of Education)	3 credits
- Educational Studies 427 (Philosophy of Education)	3 credits
- Educational Studies 428 (The Social Foundations of Education)	3 credits
- Educational Studies 429 (Educational Sociology)	3 credits
Academic, Curriculum, and Professional Electives	9 - 12 credits
(Courses selected in consultation with an advisor; candidates who wish to complete a teaching concentration in an elementary school field should select 12 credits of courses related to their pre-admission subject specialization.)	

Total program requirements: 71 - 74 credits

PRACTICUM EXPERIENCES

The Elementary Teacher Education Programs are sequentially ordered and include three practica. Each practicum plays an important part in the professional education of prospective teachers and is a prelude to the next practicum. The Faculty regards Education 418 (9) as the culmination of a sequence of practica: Education 315 (0) *Pre-Practicum School Experience*, and Education 321 (0) *Orientation School Experience: Elementary*. In recognition that Education 418 (9) is the culminating experience, all of the units for the practica are associated with that course.

- Education 315:**

 - During the first term, teaching candidates will make eight half-day visits to schools located throughout the Lower Mainland. Tasks will relate to Reading Education 310, an on-campus course, and will include instructional experience on a one-to-one or small group basis.
- Education 321:**

 - Candidates then undertake a two-week practicum designed as an orientation to the school, the classrooms, and the teachers of the extended practicum. Teaching candidates will undertake a variety of instructional tasks.
- Education 418:**

 - The culminating school experience is a thirteen-week extended practicum during which teaching candidates will experience a range of teaching assignments, including a sustained block of teaching with a teaching load of 80%.

Both the two-week school orientation and the thirteen-week extended practicum will be in the same school.

PLACEMENT FOR PRACTICA

The Faculty attempts to place candidates in the locations of their choosing. For this reason, we ask students to specify no fewer than four preferred locations for their two-week and extended practica. It may not be possible to accommodate all student requests. Teaching candidates must therefore be prepared to accept placement in schools anywhere within 125 km of the UBC Campus, arranging for and bearing the cost of their own transportation and accommodation.

Placements for the two-week and extended practica can usually be arranged in centres outside the Lower Mainland region of the province. These locations vary from year to year and are dependent upon student response.

EDUC. 315. *Pre-practicum Experience.*—Observation in educational settings.

EDUC 315 is the initial school experience for students in the elementary program. The purpose of the eight half-days in the schools is to provide student teachers with an introduction to the school setting and an opportunity to interact with students. The morning activities should be divided between observation and one-to-one or small group instructional activities. Suggestions for these activities are derived from Reading Education 310, an on-campus course. Successful completion of Education 315 is required before students proceed to Education 321.

UBC's teacher education programs are based upon the principle of gradual immersion into the responsibilities of teaching. Thus, during this practicum student teachers are not expected to assume full responsibility for an entire class. They are expected to conduct themselves in a professional manner as described in the Protocol for Students Undertaking School Experiences and to undertake instructional activities that are deemed appropriate by the school advisor and faculty advisor.

Observation: It is hoped that school advisors will observe most lessons taught by the student teacher and that faculty advisors will observe at least one lesson. It is desirable for observation to be followed by oral and written feedback.

Evaluation: School advisors are asked to complete an EDUC 315 School Experience Feedback Form. If possible, school advisors should discuss the report with the student teacher on the last morning of EDUC 315 and give the student teacher a copy. Faculty advisors are asked to ensure that UBC copies are forwarded to the Teacher Education Office.

For additional information regarding teaching practica, please see "General Regulations Affecting Teaching Practica," and "Policies and Procedures" in this handbook.

EDUC 321. *Orientation and School Experience: Elementary.*--A two-week sequence of observations and instructional assignments in a selected elementary school which usually becomes the setting for Education 418: the Extended Practicum. [0-0; 1-2]

EDUC 321 is the second school experience in UBC's elementary teacher education program. During this practicum student teachers are not expected to assume full teaching responsibility. They are expected to conduct themselves in a professional manner as described in the Protocol for Students Undertaking School Experiences, and to undertake instructional and non-instructional activities that are deemed appropriate by the school advisor and faculty advisor. The purposes of the two-week school experience for the elementary program are:

1. To provide the student teacher with opportunities to observe the way schools organize for and provide instruction.
2. To provide the student teacher with opportunities to apply the knowledge taught in the first-term university course work.
3. To provide an opportunity for student teachers and school advisors to get acquainted prior to undertaking the thirteen week extended practicum.

The following activities are regarded as appropriate for students at this point in their professional development. Selection and sequencing of activities will be the responsibility of the school advisor in consultation with the faculty advisor:

1. *Housekeeping/Management:* Prepares a seating plan; registers attendance; reads announcements; conducts pupils from place A to place B; prepares a transparency for overhead projector (initiated by another person); assists with fire drill; supervises playground; supervises lunchroom; operates filmstrip projector; operates film projector; operates ditto or other duplicating machinery; exhibits pupils' work; keeps records of pupils' achievement.
2. *Instruction:* Reads a story to entire class; prepares tasks, visual aids, chalkboard displays; reviews homework; demonstrates an experiment; helps individual pupils with 'seatwork'; instructs a small group of pupils (planning by another person); plans and teaches a lesson to a small group; teaches an entire lesson to entire class (planning by another); plans and implements instruction for entire class for entire lesson.
3. *Evaluation:* Collects anecdotal data on an individual child or group of children; administers an oral quiz prepared by another; prepares and administers an oral quiz; prepares and administers a written test; evaluates an oral test; evaluates a written test; evaluates homework; returns/discusses graded work.

EDUC 418 (18 credits) *Extended Practicum: Elementary.*—A developmental program of teaching practice, normally in one B.C. elementary school. Candidates will teach all subjects in the elementary curriculum. Prerequisite: all requirements set for Year 1. [0-40; 0-0]

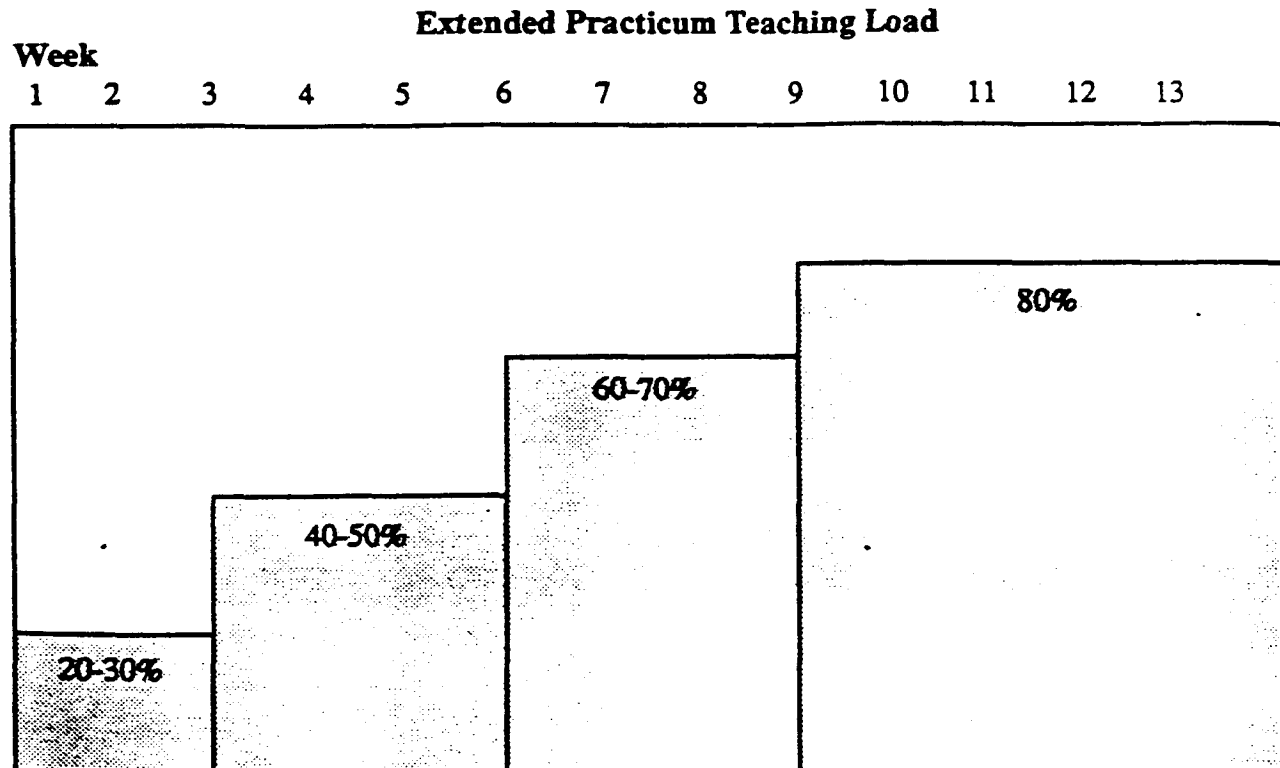
Course Overview

The thirteen-week ("extended") practicum provides student teachers with opportunities to demonstrate that they are capable of assuming the responsibilities expected of an enrolling teacher. Student teachers who have successfully completed the thirteen week practicum will have demonstrated that they can independently plan, implement, and evaluate instruction over substantial periods of time at a standard expected of a beginning teacher.

In addition to instruction, which includes the preparation, delivery, and evaluation of lessons, other important experiences of the extended practicum include:

1. Reflection about teaching, often carried out in groups of student teachers, school advisors, and faculty advisors; may include analytical discussions.
2. Observation of the teaching of other student teachers, school advisors and other teachers; observing individual school students or groups of school students.

In order to enable the student teacher to be reflective and to have time to observe in classrooms, the student teacher's maximum teaching load will be 80% of the school advisor's normal teaching load.



Note: An 80% teaching load means 80% of the school advisor's teaching assignment, rather than the expectation that a student teacher would teach 80% of any school day.

STUDENT TEACHERS' ROLES AND RESPONSIBILITIES

Pre-Practicum:

- Familiarizes self with the "Protocol for Student Teachers Undertaking School Experiences" and the "Guide to Professional Practice" in this handbook.
- Makes telephone contact with school principal and school advisor.
- Discusses the subjects and classes to be taught during the thirteen-week practicum.
- Inquires about the availability of resources in school district and procedures for accessing them.
- Explores library and other resource centres in school.
- Begins working on overviews and unit plans after consulting the appropriate curriculum guides.

Weeks One - Three:

- Is in attendance on the first day of school.
- Begins the thirteen-week practicum at the weekly percentage recommended by both the school advisor and faculty advisor(s).
- Attends and participates in three-way conference arranged to clarify the objectives of the practicum and the expectations of student teachers, school advisors and faculty advisors.
- Participates in discussions about the observation forms and procedures. Learns where copies go, the purpose of the forms and how the evaluation will proceed.
- Makes available to faculty advisor complete timetable.
- Observes teachers at work and notes good approaches and methods.

Throughout Practicum:

- Prepares lesson/unit plans in accordance with the advice of both school and faculty advisor(s) and makes copies available to school advisor at least 24 hours in advance of the time when the lesson will be taught and/or faculty advisor(s) upon request.
- Maintains binder(s) of unit/lesson plans and makes binder(s) available to school and faculty advisor.
- Re-does lesson or unit plans if advisors so request.
- Attempts to make good use of various kinds of teaching materials and teaching aids. Seeks out school and district resources.
- Discusses difficulties with school advisor(s), faculty advisor(s) and suggests possible solutions.
- Makes a contribution to housekeeping in the classroom.
- Actively participates in the overall school program.
- Maintains records of pupil performance.
- Keeps faculty advisor apprised of new/interesting developments in classroom program as well as any changes, cancellations or alternative arrangements.
- Increases teaching time in accordance with recommendations of this handbook.
- Engages in self-reflective activities regarding all aspects of teaching methods and school participation.
- Ensures that a good balance of teaching experience occurs over the course of the practicum.
- Invites observations, comments, criticisms, and suggestions for improvement.
- Makes note of and reflects upon successful methods and styles.
- Acknowledges and reflects upon areas of difficulty.
- Participates actively in structured pre and postconferences related to formal observations.

- Seeks to understand comments and checklist items noted by school and/or faculty advisor(s) and asks for clarification where necessary.
- In the case of serious concerns, discusses and seeks to understand fully the feedback from school and faculty advisor(s). Reads carefully and, if necessary, seeks clarification of the content of the Interim Report written by school or faculty advisor(s), to be submitted to the Teacher Education Office.
- At week six or seven takes part in a half-way conference arranged by the faculty advisor.

Weeks Eight - Thirteen:

- Increases teaching time consistent with recommendations in this handbook.
- Prepares for summative evaluation conducted by school advisor(s) and faculty advisor(s).
- Returns all student work and provides school advisor(s) with student marks.

Post-Practicum:

- Writes thank-you letters to school advisor(s) and to the school administration.
- Returns all curriculum materials and resources.

Faculty Advisors' Roles and Responsibilities

UBC's faculty advisors are responsible for working with schools to organize the orientation for student teachers. Prior to the students' arrival in the schools, faculty advisors should contact the schools to which they have been assigned and review the purposes of the Orientation School Experience and its relationship to Education 418: Extended Practicum (Elementary).

The faculty advisor's prime role in this practicum is to assist both the student and school advisor in establishing a professional working relationship.

Once student teachers arrive in the schools, faculty advisors are expected to make frequent visits to the schools to assist in adjustments in the placement of the student teachers, to support school staff in working with student teachers, to respond to staff questions about the UBC program, and to confer with student teachers. Faculty advisors should also orient school advisors to Education 418, providing information about UBC's Teacher Education program, the philosophy of the extended practicum, expectations of student teachers, school advisors and faculty advisors, observation and feedback procedures, and evaluation.

As time permits, faculty advisors will observe each student and provide written feedback.

For additional information regarding teaching practica, please see "General Regulations Affecting Teaching Practica," and Policies and Procedures" in this handbook.

FACULTY ADVISORS' ROLES AND RESPONSIBILITIES

Pre-Practicum:

- Makes contact with school principal and school advisor.
- Provides information about the student's program, availability of tuition fee waivers and availability of EDUC 432.
- Provides information about days scheduled for workshops related to student teaching.
- Conducts orientation sessions regarding observation and evaluation.
- Consults with teachers about the appropriate workload and grade levels to be assigned to the student teacher.
- Assesses the match between student teacher and school advisor(s).

Week One - Three:

- Ensures student teachers are familiar with Protocol for student teachers.
- Resolves any initial difficulties, anxieties, or misconceptions.
- Arranges three-way conference to clarify the objectives of the practicum and the expectations of the student teacher, the school advisors and the faculty advisor.
- Discusses the evaluation forms and procedures.
- Monitors the student teacher's initial work in the classroom.

Throughout Practicum:

- Regularly checks the student teacher's lesson and unit plans for appropriateness and completeness.
- Maintains regular contact with each school advisor to ensure that satisfactory progress of the student teacher is taking place.
- Observes the student teacher as frequently as time permits (recommended once per 5 to 7 teaching days).
- Gives written feedback after each observation where possible, using the checklist, a section of the checklist, or the open-ended comment form. Retains a copy and distributes other copies to school advisor and student teacher.
- Conducts pre and postconferences and formal observations with each student teacher (minimum bi-weekly).
- At week six or seven, conducts a half-way conference with school advisor(s) and student present to provide all parties with a picture of strengths and areas which need improvement.
- In the case of serious concern regarding the student teacher, consults Guidelines For Faculty or School Advisors Who Have Serious Concerns About A Student's Performance (p. 43).

Weeks Eight - Thirteen:

- Continues to observe and to assist each student teacher in his/her charge.
- Reviews the evaluation procedures with each school advisor and student teacher.
- Completes a set of summative evaluation forms (one checklist and one open-ended evaluation form both marked FINAL) for each student teacher.
- Coordinates the process for establishing the final standing (complete/fail) and submits the standings to the Director of Field Placement and Research.

Evaluating Student Teaching

It is hoped that students will receive both oral and written feedback from school advisors and faculty advisors.

To this end UBC Faculty of Education has designed two forms for the evaluation of student teaching. These will be distributed to all school advisors by the faculty advisor and should be used throughout the practicum.

School and faculty advisors are encouraged to provide the student teacher with some form of written feedback following each classroom observation. Both the checklist and the written comments form can be used in whole or in part. Once completed by either school advisor or faculty advisor, a copy of the evaluation form should be given to the student teacher. In keeping with the "triad" notion of communication, school advisors and faculty advisors are encouraged to share one copy of their completed form with the other two persons. Advisors should retain one copy for their records.

At the end of Education 418 both the school advisor(s) and faculty advisor write a final summative evaluation of the student teacher's performance and complete a check list. These final forms should reflect the feedback the student has received throughout the practicum. One set of forms should be completed by the school advisor and another by the faculty advisor.

APPENDIX C

Codes for:

A. MAIN ANALYSIS

1. Student Teachers' Levels of Problem Representation
2. Student Teachers' Description of the Problem Representation

B. SECONDARY ANALYSIS

1. Types of Individual Differences Noted by Student Teachers and Faculty Supervisors

1. Student Teachers' Levels of Problem Representation

- 00 = **Sensorimotor Substage 3** Precursory Unit:
 Sensory orienting response: Student teacher has ability to notice class' reaction to her instruction while she instructs the class.
 Student teacher does not notice individual differences among learners.
-

Interrelational Stage 2nd Order Relations

Mental elements are objects, people, actions

- 01 = Substage 1 A - B Whole class - Individual
 of learners learner
 Student teacher focuses on:
 Class or learners' reactions to her instruction
or individual learner's reactions to her instruction.
 If student teacher's attention is focused on the individual learner, only the effect of the individual difference in that learner is noted.
 Individual differences among learners are not identified or described.
 If solution is offered, it is directed at the whole class and does not address individual differences among learners.
- 02 = Substage 2 A1-B1 Whole class - Indiv learner
 A2-B2 Effect of indiv diff of learner
 Student teacher focuses on:
 class of learners' reaction to her instruction
while noticing one specific instance of an effect of an individual difference in an individual learner's response to her instruction.
 If solution is offered, it is a simplistic or global solution directed at either the whole class of learners or at the specific instance of an individual difference in one learner.
- 03 = Substage 3 A1-B1 Whole class - Indiv learner
 A2-B2 Variable of 1 indiv diff
 Student teacher focuses on:
 class' reactions to her instruction while noticing

and identifying 1 individual difference of an individual learner's response to her instruction. Simplistic solution is offered which attempts to address the individual difference of an identified learner but is directed at the class of learners as a whole.

Dimensional Stage 3rd Order Relations

Mental elements are categories of relations or dimensions

Student teacher is able to represent the problem/aspect of individual differences along a dimension of a given variable. There is a recognition of the complexity of the problem and a notion of balance or tradeoff between student needs and student teacher's instruction.

04 = Substage 1 A - B Index - Range of Indiv Diff.

Student Teacher focuses on:

One index of individual learner difference.

Range of the individual difference is identified.

Effect of individual difference in 1 learner and cause of individual difference is noted.

Solution is offered but it may be a simplistic or general solution that meets the needs of the class or a subgroup of learners but is not tailored to the actual individual difference identified among learners.

05 = Substage 2 A1-B1 Index - Range of Indiv Difference
A2-B2 Whole Class - Individual Learner

Student Teacher focuses on:

One index of individual learner difference.

Range of the individual difference is identified.

Complexity of the problem is acknowledged.

Notion of balance between individual or class needs and student teacher's instruction is indicated but not elaborated on.

Solution stated is a general solution or standard to be achieved. It is designed to meet whole classroom needs or subgroup of learners not individual difference identified in a learner.

Goal may be stated but not integrated into

instruction or solution.

06 = Substage 3 A1-B1 Index - Range of Indiv. Difference
A2-B2 Whole Class - Individual Learner

Student teacher focuses on:

Detailed description of the index of individual difference.

Range of individual difference is indicated.

Complexity of the problem is acknowledged.

Notion of balance between learner individual difference needs and student teacher's instruction is described.

Solution described is designed to meet individual difference in learner rather than just the whole class or subgroup of learners' needs.

Goal to be achieved is integrated into the solution

Vectorial or Abstract Dimensional Stage 4th Order Relations

Mental elements are second order categories

07 = Substage 1 A - B Std. T's Instrn - Indiv Learner
Diff

Student teacher focuses on:

One index of individual difference among learners.

Range of individual difference is identified.

Complexity of the problem is acknowledged.

Notion of balance between learner needs and student teacher's instruction and needs of whole class are described.

Solution involves adjustments in student teacher's actions, beliefs and expectations to meet individual learner's actions, beliefs, and expectations in an interactive way (One affects the other.

08 = Substage 2 A1-B1 Std. T's Instrn. - 2 or more Indiv
Learner Diffs
A2-B2 Std. T's Monitoring - Indiv
Feedback

Student teacher focuses on:

2. Student Teachers' Description of the Problem Representation

00 = 0 components, or aspects of the problem situation, problem objective, or problem strategy noted or used.

01 = 1 component

02 = 2 components

03 = 3 components

04 = 4 components

05 = 5 components

1. Types of Individual Differences Noted by Student Teachers and Faculty Supervisors

- 01 = Learning rate or time needed to learn. Fast vs. slow learners, quickness to learn.
- 02 = General Intellectual and academic ability, aptitudes
- 03 = Specific skills, abilities, aptitudes, or potential in a specific subject area (ie. art, reading ability physical education)
- 04 = Prior knowledge, information, teaching, academic background, ie. ESL student does not have prior knowledge
- 05 = Specific interest areas, differences in what students are interested in is related to a specific subject area
- 06 = General motivational levels, task commitment, keen students vs. uninterested students.
- 07 = Multicultural differences, ethnic backgrounds, different languages and customs
- 08 = Behavioral differences, discipline, activity levels, how well students cooperate, cause or don't cause problems
- 09 = Learning styles ie. visual, auditory, left and right brain, impulsive, reflective
- 10 = Attentional differences, difficulty focusing, cannot attend, perceptual, daydreaming, different from 08 (behavior problem kids)
- 11 = Maturity differences ie. behaviors not appropriate at grade level: whinning, thumbsucking
- 12 = Social Skills, teacher to student and student to

student interactions. Personality differences which affect social interactions (external/observable)

- 13 = Socioeconomic status, social, psychological background
- 14 = Personality characteristics which are internal and not directly observable ie. self-concept, self-esteem, introvertedness, extravertedness
- 15 = General category, all individual differences
- 16 = Physical differences ie. motor, deaf, blind behavior differences as a result of disease related conditions ie. cancer, CP, MS.