

CREATING MEANING WITHIN THE PROCESS OF
INTEGRATING LANGUAGE AND CONTENT:
THE ACTION OF USING GRAPHIC REPRESENTATIONS OF
KNOWLEDGE STRUCTURES TO ADAPT CONTENT TO MEET THE NEEDS OF
ENGLISH SECOND LANGUAGE LEARNERS

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Abstract

This exploratory action research describes the process of using the Knowledge Framework, and specifically graphics, within the context of a grade 6 science class in an attempt to meet the academic learning needs of English Second Language (ESL) students. It focuses on the understandings created among the classroom teacher, the English Language Support Teacher (ELST), and the students as they interacted within a naturalistic classroom setting during a science unit on Flight. An action research approach, including planning, observing, reflecting and understanding, rethinking and replanning, and evaluating was used to effect understanding and change for the participants.

Eight themes regarding the Knowledge Framework emerged from the data collected. Students' usage and understanding of graphics and the Knowledge Framework fell upon a continuum. Some students relied more heavily on the graphics they created to communicate their understanding of content. Likewise, the teachers relied more heavily on student produced graphics to assess understanding when students were at lower levels of English language proficiency. It was necessary for teachers to create tasks that encouraged students to interact with graphics to ensure that students utilised graphics in their learning. Students engaged in a cyclical process of interaction between text and graphic to clarify understanding. Students' and teachers' awareness of graphics developed as the Flight unit progressed. Graphics were used within the cluster of tasks that naturally occurred within the content class. As a result of the action research process, change in teaching practice occurred for the classroom teacher and the ELST. Conclusions and implications for teachers are discussed based on the data collected.

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I am most thankful to my family and friends who listened to me and supported me throughout this journey of discovery.

Dedication

This thesis is dedicated to all the students with whom I have dwelled within the life of the classroom. These students have challenged me as a teacher, a learner, and a human being within the context of the school. From this challenge have emerged questions, understandings, and possibilities for learning, some of which are embodied in this thesis.

Thank you.

Chapter One

Creating Context and Emerging Questions

Introduction

As an English Second Language (ESL) specialist working with elementary school ESL students, I am faced with the daily challenge of meeting the diverse learning needs of students at varying levels of English language proficiency. Over the past six years many questions have arisen from my experiences as a teacher working within this teaching context. Underlying all these questions is the one question, "How do I teach these students without limiting their educational opportunities and outcomes within our school system?" The questions which emerged from my experiences as an ESL specialist were the impetus for this research.

A Question

In this research I attempt to explore means of providing equity of opportunities for elementary school ESL learners to access school knowledge. Ultimately it is through these opportunities that students will have choices that may create equity of educational outcomes. My purpose in this research is to explore the process of using graphic representations of text/knowledge structures, within the context of planning, collaborating, teaching, and learning, to enhance ESL students' learning of academic language and content knowledge. The research question

that I explore in this study is as follows:

In what ways and to what extent do graphic representations of text/knowledge structures enhance ESL student academic learning within the context of a grade six science class?

What happens when an integrated language and content approach is used within the context of a grade six science class? What meanings and understandings are created for teacher and student in the naturalistic environment of the 'living' classroom? What will I perceive and understand as teacher/researcher during my observation and reflection within the action research process?

Background to the Question

This question becomes particularly meaningful within the context of the changing nature of the student population in the Vancouver School District. Perhaps the most significant influence behind this change has been the increasing percentage of ESL students in Vancouver School Board (VSB) classes. Of the 1990/1991 student enrolments in Vancouver, 41 % were ESL (Malatest 1991, 73). During the 1993-1994 school year 53.5 % of the school population in Vancouver spoke a primary language other than English within their homes (B.C Ministry of Education, 1993). As the percentage of elementary and secondary ESL students in Vancouver increases, the pedagogical and instructional demands placed on teachers change and increase.

One of the major demands placed on both ESL specialists and content specialists

is the presentation of cognitively demanding and age-appropriate content to students of varying levels of English language proficiency (VSB, 1991). If the aim of education is to provide equal opportunity and outcome for all learners regardless of first language and level of English language proficiency, then the responsibility this demand places on educators becomes particularly expedient.

Given Cummins' (1981) finding that young children generally require 5-7 years to develop a level of academic language equivalent to that of native speakers, some ESL children may spend the majority of their elementary school-aged years at a non-nativelike level of academic English language proficiency. This has far-reaching implications for both students and teachers, as teachers need to adapt their teaching to support these learners and provide students with strategies that will help them succeed within the school context. In addition to these varying levels of academic English language proficiency, are the diverse backgrounds of these students. These two aspects of ESL students' knowledge, level of English language proficiency and background knowledge, impact ESL students' understanding of content texts (Carrell & Eisterhold, 1988). How can ESL specialists and content specialists provide equity of educational opportunity and outcome for ESL students, as prescribed by the Languages and Multicultural Programs Branch of the British Columbia Provincial Government (Ministry of Education, 1993)?

One means of enhancing ESL students' academic/content learning (including reading, writing, questioning, and ways in which students can represent and demonstrate their knowledge), might be to employ a teaching and learning model

that systematically integrates language, content, thinking skills, and the use of graphics.

Mohan's (1986) , model for integrating language and content (ILC) involves explicit teaching of text/knowledge structures by means of graphic representations. These representations of knowledge structures can enhance student comprehension of academic/content texts, by familiarising students with the underlying structure of expository texts (Tang, 1992). Studies have been conducted to examine the effect of graphic representations of text/knowledge structures on ESL adults' reading (Carrell, 1986 & Carrell, Pharis, & Liberto, 1989) and on the effect of graphic representations of text/knowledge structures on elementary and secondary students' learning (Early, Mohan & Hooper, 1989; Early & Tang, 1991; Tang, 1991, 1992, 1994). However, many of these studies have been product oriented, examining the effect of ILC and the use of graphic representations of text by looking at the products produced by the students in both naturalistic classroom settings and experimental settings. Within this study, on the other hand, I seek to go beyond product to explore the process of ILC instruction and the meaning created within the classroom.

By exploring the process of ILC instruction, I am exploring how ILC was used within a certain context and by certain participants. The findings and understandings created by this study are not intended to be generalizable to other situations and contexts, because I feel that teaching situations are uniquely created by the participants within them. Within the context of this study, I try to discover how participants perceive ILC instruction and the use of graphics and what happens between student and student, student and teacher, and teacher and

teacher when ILC is used to plan, teach, and evaluate a science unit. I will report on eight themes that I identified during and after the research process--seven themes that I have experienced as new understandings that inform my knowledge and teaching practice.

An Action Research Method

In this study I address the research question by means of 'Action Research' and 'Teacher as Researcher' within the natural context of a grade six science class (Elliott, 1991). This form of inquiry-teaching is used to facilitate a link between theory and practice and further, as a means of critically implementing theory into everyday teaching practice (Kemmis & McTaggart 1982, cited in Nunan, 1990). Specifically, this form of inquiry-teaching is used to facilitate a link between Mohan's (1986) model of integrating language and content and what is created in the classroom between teacher and student, between student and student, and between the curriculum-as-plan and the curriculum-as-lived (Aoki, 1993). It is within these *spaces* between theory and practice, teacher and student, and student and student, that I have been able to move towards a deeper understanding of how best to use graphic representations of text and integrated language and content instruction.

I used both qualitative and quantitative research methodologies in this study. I collected data on an on-going basis throughout the study. I collected qualitative data through fieldnotes, classroom observation, reflective journal writing, informal and formal discussions with students and the classroom teacher, and student work samples. I collected quantitative data through unit-end test scores, student work

samples, and formal student interviews. A critical aspect of my research was achieved through reflection. I used reflection during the course of the study and also at various time intervals after data were collected. In this way I re-visited the data to gain insight into their many meanings.

The data collected in this study provide a basis for understanding what ILC instruction and specifically the use of graphics, *looks like* within the life of the content classroom. The Knowledge Framework model appears to have positive effects for students, teachers, and educational change.

Definition of Language Within the Context of this Study

As language is so important to understanding and as each of us carry within ourselves our own understandings of language, it is important that I define the key language that I will use in my study. The **Knowledge Framework** is an organising framework of language and thinking skills which apply across the curriculum (Mohan, 1986). It is composed of six knowledge structures which can be divided into two categories:

- Theoretical or Background Knowledge:
Classification, Principles, and Evaluation.
- Practical or Action:
Description, Sequence, and Choice.

My understanding of the Knowledge Framework has evolved during my years of teaching. Initially, my understanding of the Knowledge Framework was dominated by my practical context as a teacher. Next, as I read about the Framework, my exposure to the Framework's theoretical background began to expand my

understanding and 'fill-in' what I perceived as gaps in my knowledge. Later, with the encouragement of the author himself through a course which I took, I began to search for connections between the *theory* of the Framework and the *practice* of the Framework within the context of my own teaching. The exploration of this current study has been an opportunity for me to *re-search* my understanding and definition of the Knowledge Framework.

Knowledge Structures are ways of thinking which are constant across cultures and content. They organise information and have corresponding language structures and graphics.

Graphics (Key Visuals) are visual representations of the knowledge structures and content. They support students' learning and understanding of content in three interrelated ways. They may be generative, representative/explanatory, or evaluative (Early, 1990). These three functions of graphics are not necessarily distinct, as graphics within a particular tasks may have more than one function. Graphics may be teacher produced or student produced.

Integrating Language and Content Instruction is a type of instruction that teaches content, teaches language through content, and teaches the language of content.

I use **Narrative** to mean reflective writing that looks beyond the recollection of facts to a deeper level of meaning and understanding of a situation. By nature this writing is personal and subjective as the writer re-creates reality from her own

perspective, while attempting to create deeper understandings of events within a certain context.

Tasks are the teacher created activities that students engage in for the purpose of learning content, learning language, and learning how to utilise specific thinking skills.

Organisation of the Thesis

This thesis will be organised as follows. In Chapter Two I will review selected literature within the areas of Text Structure and Graphics, ILC Instruction and the Knowledge Framework and Graphics, and the definition of Action Research. In Chapter Three I will discuss the study, including the method and the process. In Chapter Four I will discuss eight themes that I have identified within the data and their implications for teaching and learning. In the epilogue I will discuss some thoughts that are not final, but rather part of an *on-going* process of meaning-making and creating understanding.

On the pages that follow I have chosen to use different fonts. Shifting from font to font represents a movement in my thinking from the main text to an aside or tangent that emerged from the narrative process. I use *italics* for individual words or phrases within a sentence to emphasise the movement inherent for me in these words or phrases. I feel that this emphasis on movement is representative of the on-going cyclical nature of the action research process, and therefore my use of different fonts and italics is critical in creating a feeling of movement for the reader. I choose to write this thesis in the form of narrative. I feel that narrative embraces the essence of this research and enables the reader to recreate this research

within his/her own understanding of and experiences with the Knowledge Framework and graphics. The narrative writing I experience within the research process opens me up "to a deeper understanding of the meaning of the lived experiences " within the four walls of the content classroom (Aoki, 30, 1992). I willingly accept the subjective nature of the narrative form, as my experiences and evolving understandings of teaching contribute to the meaning that I create from and within my work.

Chapter Two

Re-viewing the Literature

Introduction

I have organised this selected review of literature into four sections, 1. Text Structure, 2. Schema Theory and Graphics, 3. ILC Instruction, 4. the Knowledge Framework and Graphics, and 5. Action Research. My purpose in this organisation is to illustrate developments in the field of teaching English as a second language (TESL) that assist ESL learners to read, understand, and use content information. In addition, the four sections mentioned above represent the process of my learning and thinking as it relates to this research. Figure 2.0 illustrates my thinking during the research process.

At the core of my thinking is the Knowledge Framework and the use of graphics. My understanding of the Knowledge Framework and graphics is supported by knowledge from the areas of text structure, schema theory, and ILC instruction. I understand the similarities between text structure and the Knowledge Framework, I regard the Knowledge Framework in a different light because it goes beyond a way of viewing text to be a basis for collaboration among ESL teachers and classroom teachers. I chose to explore what happened in a classroom in which the Knowledge Framework and graphics were used by means of Action Research. The Action Research process was my guide to discovering and uncovering new meanings within the content classroom.

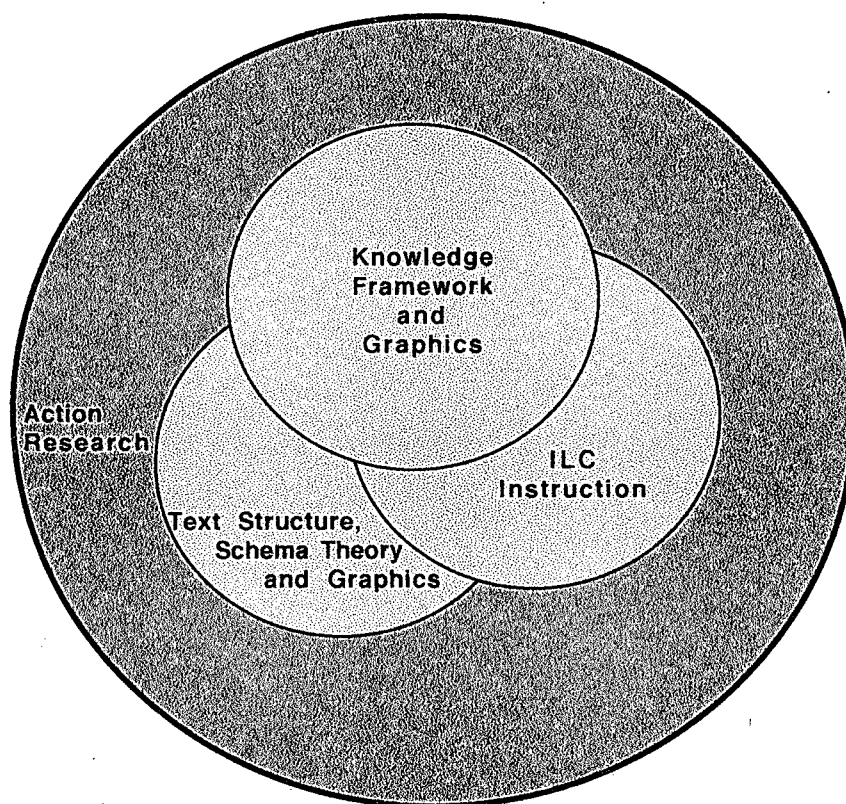


Figure 2.0
Organization of Re-view of Selected Literature

Text Structure, Schema Theory, and Graphics

The areas of text structure (Taylor & Beach, 1984) and schema theory (Carrell, 1984) have long been considered areas of research and knowledge that impact ESL teaching and learning. Schema theory refers to the role of the reader's background knowledge in comprehending reading texts (Carrell & Eisterhold, 1988). Text structure refers to the underlying structure of a text, as defined by the writer of that text (Horowitz, 1985a, 1985b).

Schema Theory.

Schema theory has emerged out of a psycholinguistic model of ESL reading (Coady, 1979), in which a reader's background knowledge interacts with conceptual abilities, process strategies and the text to create meaning for the reader. A reader's schema or previously acquired knowledge structures, will impact how that reader comprehends a text. Carrell (1984) studied the effect of simple story schemata on ESL learners' comprehension of stories. Quantity of recall increased when the structure of the story matched the reader's schema for simple stories. Further, recall of texts that did not match the reader's schema was influenced by and exhibited the pattern of the reader's schema rather than the input order of the text.

ESL learners with diverse cultural, educational, and experiential backgrounds, may not have background knowledge or schemata that matches that of narrative and expository texts found within the school system. More specifically, ESL students may not have the appropriate formal schemata (understanding of rhetorical organisation) or content schemata (background knowledge of the content area) in order to interact successfully with a text (Carroll, 1988). Supplying ESL students with ways of eliciting and building background knowledge, with regard to both formal and content schemata, may help them become more successful readers of both narrative and expository texts.

Text Structure.

The process of familiarising ESL and English first language students with text structure has elicited higher levels of recall, comprehension, and production of

expository text. Taylor and Beach (1984) found that reading instruction based on text structure improved seventh grade students' recall of expository texts and influenced their ability to produce expository text. Other studies found that a key element in improving comprehension and recall by teaching text structure before reading, was student interaction with the text (Slater, Graves & Piche, 1985 & Berkowitz, 1986). Student identification of text structure can be enhanced by recognising semantic signals that represent specific patterns within a text (Geva, 1983 & Piccolo, 1987).

Common to all of these studies is the use of a graphic to represent text structure. Graphic organisers are thought to activate a reader's prior knowledge and to elicit encoding strategies that will increase retention (Alvermann, 1981). The use of graphic organisers to represent text structure has yielded positive effects on English first language students' recall of expository texts (Alvermann, 1981; Boothby & Alvermann, 1984; Hawk, 1986).

Integrated Language and Content Instruction

Integrated language and content (ILC) instruction is an approach to second language learning that has been a focus of many researchers and teachers (Mohan, 1979, 1986, 1991; Swain, 1988; Brinton, Snow, & Wesche, 1989; Wong Fillmore, 1989; Snow, Met, Genesee, 1989; Early, Mohan, & Hooper, 1989; Dunbar, 1992a & 1992b). Mohan (1991) defines ILC as,

mutual support and cooperation between language teachers and content teachers for the educational benefit of LEP students. Language development and content development are not regarded in isolation from

each other and there is a focus on the intersection of language, content and thinking skills. (p.113)

The rationale for ILC instruction is based on the needs of the student. Brinton, Snow, and Wesche(1989) suggest that,

The language curriculum is based directly on the academic needs of the students and generally follows the sequence determined by a particular subject matter in dealing with the language problems which students encounter. The focus for students is on acquiring information via the second language and, in the process, developing their academic language skills. (p.2)

They identify five rationales for ILC instruction,

1. For successful language learning to occur, instruction needs to consider the ways in which the learner will use the language.
2. The use of content that is relevant to the learner motivates the learner to learn not only the content but the accompanying language as well.
3. Teaching should build upon the language and content background knowledge and experiences of the learner.
4. Language needs to be taught in a context of use, rather than in isolation. In this way the learner becomes aware of grammar patterns and the discourse features of the English.
5. Based on Krashen's theory of 'comprehensible input', the student must understand the target language input and therefore focus on meaning rather than form. In addition, input should include new structures to be acquired.

These five rationales have direct implication for ESL students within an

elementary school. Within an elementary school the learner's goal is to not only use English in a conversational manner, but to also use English to learn various types of academic content. The use of content is relevant to the learner in that the content is the main focus of the learner within his/her daily life. The elementary curriculum builds upon what is learned from year to year from kindergarten to grade seven. New learning builds upon what was previously learned. Content classes provide a context of use that have their own discourse patterns that need to be learned in order for a student to understand, learn, and represent new information. Content classes require students to learn information that combines both new and known content and linguistic elements.

Models of ILC Instruction.

Several models of ILC instruction have been developed in response to the needs of ESL learners (Brinton, Snow & Wesche, 1989; Chamot & O'Malley, 1987; Mohan, 1986). Although these models vary in purpose and context of use, they all assist ESL learners' understanding of content materials.

Brinton, Snow, and Wesche (1989) describe three models for ILC instruction, theme-based, sheltered, and adjunct. In a theme-based model students acquire the L2 through themes within specific topic areas. A sheltered model segregates students from the mainstream, but covers the same content using modified materials and language. In an adjunct model students are enrolled in two linked courses. A content course, taught by a content specialist, and a language course, taught by an ESL specialist, that supports the development of the language and skills needed within the content course. In each of these three models English

language teaching is not done within the context of mainstream content classes.

Another model is the Cognitive Academic Language Learning Approach (CALLA) developed by O'Malley and Chamot (1987). CALLA was designed as a bridge between special language programs and mainstream classes. Its intent is to "introduce vocabulary, structures, and functions in English by using concepts drawn from content areas" (p.229). CALLA has three major components. First, the CALLA content-based curriculum "is based on authentic subject matter from the mainstream curriculum which has been selected as central to the concepts and skills that are developed at particular grade levels" (p.236). Second, English is seen as a tool for learning academic subject matter. Language instruction focuses on the four skill areas of listening, speaking, reading, and writing. Third, students learn to use three types of learning strategies: cognitive, metacognitive, and social-affective. This model was not intended to replace mainstream content classes, but rather to prepare intermediate and advanced level ESL students for mainstream content classes.

The last model of ILC instruction that I will discuss is the Knowledge Framework. Mohan (1986) describes the Knowledge Framework as a "general framework for the body of knowledge in an activity. An activity is a mode of thought and conduct. An activity has a pattern of action which includes description, sequence, and choice, and involves background knowledge which includes classification, principles, and evaluation." (p. vi). Figure 2.1 illustrates the organisation of knowledge structures within the Knowledge Framework.

Theoretical Knowledge		
Classification	Principles	Evaluation
Description	Sequence	Choice
Practical Knowledge/The Action Situation		

Figure 2.1
The Knowledge Framework

Knowledge structures within an activity are only one component of the Knowledge Framework. Each knowledge structure has specific discourse structures that are used to represent/express information. In addition, each knowledge structure can be represented by specific graphics. The Knowledge Framework integrates the teaching and learning of knowledge structures (thinking skills), language, and graphics within the context of an activity.

The Vancouver School Board Language and Content Project (Early, Mohan, & Hooper, 1989 and Early, 1990) is an example of how the Knowledge Framework can be used to integrate the teaching of language and content across the curriculum. In this project, teams of teachers, including ESL teachers, mainstream teachers, and administrators, were established in eight elementary and four secondary schools. These teams collaboratively produced curricula and resource materials for ESL students within ESL classes and within mainstream content classes. The school-based teams worked with research teams from the University of British Columbia with the purpose of "analysing needs, developing strategies and sample lessons, testing these strategies and lessons in the classroom, developing methods for teachers to evaluate the effectiveness of the materials, and producing curricula and resource materials." (p. 111). This research project was influenced by the area of collaborative action research, wherein university researchers worked collaboratively with teachers in schools to conduct research.

Dunbar (1992a & 1992b) has combined the roles of teacher and researcher in his investigation of integrating language and content instruction. His research was prompted by his teaching situation at the time, secondary English classes with a high percentage of ESL students. His first study (1992a) describes an approach to teaching the vocabulary that the students encounter in their content courses. The approach can be summarised in the following steps:

- 1) students select words from their content classes (social studies, science, math, P.E., etc);
- 2) students think of ways to classify their list of words;
- 3) students explain the principles behind their word classification system;

- 4) students are given a spelling test of their list of words.

In this approach to vocabulary development based on the Knowledge Framework, students are engaged in the following thinking skills:

- 1) evaluating
- 2) choosing
- 3) patterning and sequencing
- 4) defining
- 5) classifying
- 6) explaining the principles behind their classification system

By using the Knowledge Framework to structure an activity common to most elementary and secondary classes, "vocabulary development is elevated to a level that shows its relevance to all subjects" (p. 78).

Dunbar's second study (1992b) examines ways of helping students improve their summary writing. He reported using the Knowledge Framework to "analyse a task and develop a visual to support students while performing the task" (p. 67). In this instance, a visual or graphic is used to help students organise content and language. Language or linguistic performance was observed to be positively affected by the student's use of the graphic. Without the graphic, "when the student was trying to perform all aspects of the task at once, linguistic structure was lost in the shuffle" (p.67). However, by using the graphic the student was able to demonstrate a higher level of understanding of sentence structure.

Early, Mohan, and Hooper (1989); Early (1990); and Dunbar (1992a &1992b)

demonstrate one approach to integrating the teaching of language and content. This approach involves using the Knowledge Framework to analyse and plan tasks for ESL students, and use graphics to support learning. The work of these researchers constitutes a form of Action Research, as they work *with* teachers or *as* teachers in the content classroom.

The Knowledge Framework and Graphics

Recent research has been conducted concerning the Knowledge Framework and focusing on the area of graphics. This body of research has investigated different issues surrounding the Knowledge Framework and graphics. Some issues that have been investigated are teacher use of the Knowledge Framework and graphics within their classrooms and effects on student learning (Early, 1989 & 1990; Early & Tang, 1991; Tang, 1992 & 1993a), learner perception and awareness (Tang, 1991a & 1991b & Grant, 1995), and the collaborative process and assessment (Tang, 1994; Hurren, 1994; & Mohan & Low, 1995).

Teacher Use and Effects on Student Learning

Early (1990) presents the 'thematic unit' as a means by which teachers may implement the Knowledge Framework in their classrooms. She describes the teaching and learning processes involved in a series of tasks during a unit on fish. The aim of the thematic unit is to "develop language competencies for academic tasks" (p.574) and enable teachers to "adapt their current instructional practices to accommodate different degrees of English proficiency and different learning rates and styles of their students" (p.574).

Early (1989) proposes the use of 'key visuals' or graphics as a way "to teach ideas and the relationship between ideas, and to promote academic language proficiency" (p. 204). She provides a six-step procedure for creating key visuals from content texts and a seven-step procedure for implementing the use of key visuals in the classroom. These procedures were based on the research findings arising from the Vancouver School Board Language and Content Project, and were intended to be used by ESL class teachers and content class teachers both inside and outside the project schools.

Similarly, Early and Tang (1991) propose the use of key visuals as a prereading strategy following the same six-step development and seven-step implementation procedures mentioned previously. The researchers conducted a formal evaluation of this technique in a grade 8 social studies class, a grade 11 social studies class, and a transitional ESL science class in two Vancouver secondary schools. The findings of this quantitative study indicated that "using key visuals to present content-area knowledge can increase secondary ESL students' ability to read content text and write academic discourse" (p.42).

In two later studies Tang (1992 & 1993a) explored the effects of graphic representations of knowledge structures on ESL student learning at the elementary and secondary levels. At the elementary level, students' recall of information and the structure of the students' written recall was enhanced by "using a graphic representation of the knowledge structure of a passage to present knowledge to students, and making sure they attended to the graphic" (p.187). Similarly at the secondary level, using graphics enabled all students to

understand the concepts presented and to express their understanding of information in the form of short paragraphs. Although their writing included mistakes, "they were cohesive texts because all students attempted to use the linguistic and cohesive devices the teacher had emphasised" (p. 144). This observation has direct implications for classroom teachers using the Knowledge Framework: "linguistic devices characteristic of a knowledge structure have to be explicitly taught" (p. 144).

Learner Perception and Awareness.

Student perception and awareness of graphics has been explored by Tang (1991a & 1991b) and Grant (1995). In her naturalistic study of two grade 7 classes, Tang found that even though students were exposed to many graphics in their content texts the majority of students did not pay attention to or utilise graphics as a source of information. Graphics appeared to be an 'untapped' source of information for teaching and learning. In a later study, Tang (1991b) found that grade 7 ESL students "begin to understand the cognitive functions of graphics only after the functions have been pointed out to them" (p.7). Grant (1995) provides support for this finding with her research that explores the direct teaching of knowledge structures and the use of graphics to grade 6 and 7 ESL students within an English Language Centre setting. She concludes that it "appears that the development of student awareness and usage of Knowledge Structures can be a very worthwhile activity, which may provide benefits for both first and second language students at all grade levels" (p. 66).

Collaboration and Assessment.

An underlying theme of the Knowledge Framework as defined by Mohan (1991) is the,

mutual support and cooperation between language teachers and content teachers for the educational benefit of LEP students. Language development and content development are not regarded in isolation from each other and there is a focus on the intersection of language, content and thinking skills. (p.113)

The necessity for collaboration between language teachers and content teachers has been an area of interest for researchers (Tang, 1994; Hurren, 1994; & Mohan & Low 1995). The Knowledge Framework provides a foundation for collaboration between ESL teachers and content teachers as they attempt to integrate the teaching of language and content. Tang's naturalistic study (1994) at the secondary level demonstrated "one successful attempt of two teachers to effect teacher-teacher collaboration and language-content-computer studies integration using the Knowledge Framework as a tool for communication between teachers, for curriculum design, and for classroom task development for the unit (p. 115). Hurren (1994), in a case study of the collaborative process, provides further evidence for the positive effects of collaboration between ESL teachers and content teachers. In her study the "Knowledge Framework functions as both a general planning tool for structuring the unit as a whole and as a specific guide for the selection of goals and strategies within individual tasks" (p. 96).

The above two studies focus on the collaborative planning of tasks within a unit. Recent work by Mohan and Low (1995) explores the issue of "collaborative

teacher assessment". They present collaborative teacher assessment as a "process that asks different teachers teaching the same course to define collaboratively and then apply consistently evaluation criteria to ESL student responses to common test questions" (p. 28). This type of assessment is an attempt to assess, in a consistent manner, both the language and the content within a particular task. Central to this idea is "the requirement that the evaluation is based on an actual overlap or intersection of language goals and content goals" as opposed to "having two separate lists of goals" (p. 30). The authors call for future work in this area that centres around dialogue between collaborating teachers, second language researchers, and functional discourse analysts.

In recent years there has been a growing body of research regarding the Knowledge Framework and graphics. Some research has been exploratory in nature (Grant, 1995), some has been product oriented (Early, 1989 & 1990, Early and Tang, 1991, Tang, 1992 & 1993a), and some has investigated discrete experiences and processes arising from the use of the Knowledge Framework and graphics (Tang, 1991a & 1991b, Tang, 1994, Hurren, 1994, & Mohan & Low, 1995). All of the stated research has called for further investigation of issues related to the Knowledge Framework. The research that I have conducted is exploratory in nature and focuses on the processes found within a content class that used the Knowledge Framework and graphics to access content texts and information. The processes and interactions between student and teacher, student and student, teacher and teacher, student and text/graphic, and teacher and text/graphic, which led to new understandings and meanings regarding teaching and learning. Discrete processes and products are a part of the

research, but are parts within the entirety of experiences within the content class. The research explores the experiences of the stakeholders within the four walls of the classroom, the students, the content teacher, and the ESL support teacher, as they move through a process of action research.

Action Research: Shaping My Research and Orienting My Teaching

My purpose in this section is to create a "habitat" for my research and to provide for the reader an understanding of action research as my chosen form of inquiry and beyond that, my chosen form of teaching. Action research might be defined as, a particular attitude on the part of the practitioner, an attitude in which the practitioner is engaged in critical reflection on ideas, the informed application and experimentation of ideas in practice, and the critical evaluation of the outcomes of such application (Nunan, in Richards and Nunan, 1990).

In this sense action research is an orientation towards teaching and learning, rather than a research methodology. Teacher and researcher or teaching and research synthesise to become one. The process of action research provides a guiding framework from which teachers may experience new "ways of seeing; ways of knowing. Ways of teaching; ways of learning about teaching" (Shulman, 1991). It is from this perspective that I view action research and that I view my research as a "form of teaching" (Elliott, 1991).

The impetus for my research emerged from my teaching context, from what is "lived" within the spaces of the classroom. Impacting my research is the interplay and tensionality between theory and practice. McCutcheon and Jung describe

this interplay and tensionality in terms of teachers developing "through their actions, interrelated sets of beliefs and practices about matters such as how students learn, what they should learn, and how motivation occurs. These interrelated sets of beliefs and practices constitute personal theories of practice." (1990, p. 144). My theory is constituted from my personal theories of teaching which have arisen from my experiences as teacher and my "learned" theories of teaching which have arisen from my reading and study as student. My practice is constituted from my response to my teaching context and experiences and from the influences of my reading and area of study. Action research enables teachers to "trust their own capacities to assign meaning through action and reflection" (Miller and Pine, 1990, p. 56). Emerging from the tensionality between theory and practice is the development of a "practical wisdom" (Elliot, 1991) which informs practice and personal theories of teaching and learning.

In my exploration of the use of the Knowledge Framework and graphics within the context of a grade six science class, I attempted to discover what this theory, the Knowledge Framework, "looked like" within this class context. To use Aoki's words, the Knowledge Framework was the "curriculum-as-plan" and the class context represented the "lived space where teachers and students dwell in face-to-face situations" (1993, p.98). Action research enabled me to "open-up" the Knowledge Framework and graphics to "their meanings in the lives of teachers and children" (Carsen, 1990, p.172). In my research I was not necessarily looking for discrete answers, but rather extending and furthering my understandings about the Knowledge Framework and graphics, teaching, and learning. In this sense my questions within my research were "meaning questions". As van Manen

proposes,

meaning questions, however, cannot be "solved" and thus done away with.

Meaning questions can only be better or more deeply understood so that, on the basis of this understanding, I may be able to act more thoughtfully and more tactfully in certain situations. (1990, p.155)

I believe that the understandings that have emerged from my research have enabled me to act more thoughtfully and more tactfully in the context of working with ESL students. My teaching practice and my theories about teaching and learning have changed and evolved.

Inherent in the action research process is the notion of change. As van Manen states, "the expectation that action research involves change is so basic that action research is commonly defined as the process by which teachers bring about change in their own pedagogical practice" (1990. pp.152-153). The action research process enabled me and the content teacher to effect change in our teaching practice, to the immediate and perhaps long-term benefit of the students in the content class. This change was due in part to the relevancy of our research experience. Referring to action research Crookes proposes that " its results are actually as relevant to the immediate needs and problems of teachers as any research can be . . . it supports the process of teacher reflection, which is vital for educational renewal and professional growth" (1993, p.137).

Relevancy of research leads us to the notion of generalizability of research findings. The intent of my research was not necessarily to produce generalizable findings, but rather to create "situational understanding" (Elliott, 1991). For myself,

the classroom teacher, and the students, our situational understanding concerned the content class using the Knowledge Framework and graphics. Perhaps, "an enhanced understanding of the particularity of a teacher's situation is more important than generalizability, and that replicability and transferability are less important than authenticity and accountability" (Sharples in Kelly, 1985, p.131). Action research has the capacity to inform immediate pedagogy within the context the research was conducted. As I develop understandings and theories about teaching and learning, I have the capacity to transfer these understandings to other teaching contexts.

Re-visiting the Literature Review.

My purpose in this literature review was to orient the reader to the processes of my learning and thinking as it relates to my research. I tried to create a habitat for my research. Such a habitat being a place in which my research might "dwell" and become a "constituent" of its surroundings.

Chapter Three

The Research Process:

Searching for Understanding Within the Content Classroom

Introduction

In this chapter I will describe and explore the study, including the method and the process of the research. I used both qualitative and quantitative research methods to collect data. The research methods I chose were driven by the context and content of the research. I used qualitative methodology to explore how and in what ways graphics and the Knowledge Framework approach affected classroom activities and tasks and the attitudes of the classroom teacher and the students. I used quantitative methodology to explore the extent of the impact or influence of graphics on student attitudes and work produced. I chose the types of qualitative and quantitative methods to complement each other and to create a sense of what the Knowledge Framework and specifically the use of graphics *look like* within the life of a content classroom. I will expand on the types of qualitative and quantitative methods later, as I narrate the action research process.

An underlying theme of the research was the development of new understandings about graphics and Knowledge Framework instruction and learning. It was through these new understandings that educational change slowly began to take shape for the classroom teacher, the students, and myself. It was also through these new understandings that the research itself changed and created new meaning for me, both as a researcher and a teacher.

Setting and Participants

This study took place in a grade six science class in a large elementary school in the Vancouver School District. I chose this class to be part of this study because it was the natural setting in which I taught collaboratively with a classroom teacher. I provided in-class English language support for the students in this grade six science class. This particular class and elementary school have a high percentage of ESL students.

During the 1993-1994 school year 80 percent of the population of this elementary school was identified as ESL, according to Ministry of Education Form 1701. Form 1701 is a "Student Level Data Collection" form used by the Ministry of Education to assess the funding and staff allotments that each school in British Columbia will receive. One section of form 1701 deals with ministry funding for ESL students. The ministry defines ESL students as those students for whom teachers need to adapt their teaching or those students who receive support from ESL staff. Of the twenty-three students that were in the grade six science class, twenty-two had English as a second language. Sixteen of the students from this class and three students from an ESL reception class who integrated into this class for Science, Math and Physical Education consented to participate in this study. An ESL reception class at the intermediate level is a government funded class which usually consists of twenty intermediate students (grades 4-7) who are more than two years below grade level in English reading, writing, listening, and speaking. The students may be new arrivals to Canada or they may have spent one or more years in a mainstream class in the primary grades (kindergarten, grades 1 to 3). A detailed description of the participants is summarised in Appendix A. All the

students in the science class participated in the same activities, as these activities were part of the day to day teaching and learning within the class. However, I did not analyse the work and reflection of those students who did not consent to participate in the study.

The reading levels of the students in the grade six science class ranged from grade 4.2 to grade 8.5, according to the Canadian Test of Basic Skills taken mid-way through the school year (February). Of the sixteen students from this class participating in the research, 9 had reading scores below grade level, 3 had reading scores within grade level range, and 5 had reading scores above grade level. The three students from the ESL Reception Class were all reading more than two years below grade level, as identified by the ESL Reception Class teacher using Curriculum Based Assessment measures. These Curriculum Based Assessment measures included graded reading material that was used in the ESL Reception Class. As is evidenced by the above reading scores and substantiated by the professional opinion of the classroom teacher, the majority of the students participating in this study were at a level of academic English language development that required some form of English language support.

The classroom teacher was a young teacher, who had taught for approximately eight years. He had taught at this school for about seven years. He was quite active in school sports and coached volleyball, basketball, track and field, and noonhour games. In addition to teaching his own class, he taught other divisions Computer and Physical Education. In our discussions he had expressed an interest in teaching science and had acquired many science resources that he

used to plan and teach science units. He became interested in the Knowledge Framework and the use of graphics when he began to work collaboratively with the first English Language Support Teacher (ELST) to work at this school. He used the Knowledge Framework as a means to lower the language barrier and to help ESL students understand content texts. He worked with this ELST for one year, collaborating to adapt the grade six social studies text and curriculum to meet the needs of the high percentage of ESL learners in his class. It became apparent at the beginning of our collaboration that he did not understand how graphics, thinking skills, and language interacted together within the Knowledge Framework. The classroom teacher and I had collaborated on fieldtrips and special activities within the school, integrating our two classes. This initial experience with collaboration and the Knowledge Framework proved to be positive for the classroom teacher and perhaps paved the way for our science collaboration. For the classroom teacher and I, the Knowledge Framework was 'common ground'. Although we were at different levels of understanding and use of the Knowledge Framework, we both believed in its value for teaching and learning. The Knowledge Framework was our "shared philosophy" (Shannon & Meath-Long, 1992).

The students participated in the formal part of this study for a period of 12 weeks. However, the students had been working with me and the classroom teacher, using the Knowledge Framework and graphics, since the beginning of the school year in September. Within the 12 week period I worked with the students three forty minute periods each week. These three periods were a part of the four regularly scheduled science periods the students had in their timetable each

week. I worked with the students for only three out of the four regularly scheduled science periods, as these were the number of English language support periods allotted to this class. Because of the high ESL need within the school, each class in the school had a limited allotment of English language support. Each forty minute science period consisted of different combinations of the following types of activities:

- 1) Teacher directed lessons (by either the classroom teacher or myself) involving both explicit and implicit teaching of science content and aspects of the Knowledge Framework and graphics.
- 2) 'Hands-on' activities and tasks to promote student interaction with graphics and texts and to support understanding of content and concepts.
- 3) Individual student reflection (both written and oral) about student tasks, activities, and the use of graphics.
- 4) Student work time to complete work that was in progress.
- 5) Whole class discussions about the content taught and the means in which content was presented. These discussions usually took the form of review of content and activities from the previous day or days.

The above five types of activities were representative of the combined teaching styles, procedures, and approaches of myself and the classroom teacher. In addition, I felt that it was important that students participated in the reflective process, so that they might gain understandings about the use of graphics and the Knowledge Framework approach. I designed review activities that incorporated questions that encouraged reflection on what the students were doing in class.

Think about the work we have been doing about parachutes. What has helped you to understand the topic parachutes?

Think about the three parachute designs you drew. Why do you think we drew pictures of parachute designs before we made parachutes?

I hoped that through reflection students might bring new understandings to a conscious level, and in turn, be able to use strategically and independently what they had learned. If students understand what makes them effective learners then they may themselves change the way they approach learning. In this way the students became a part of the process of change, as they and the classroom teacher and myself began to develop new understandings about teaching and learning in the midst of our experiences with each other.

What was *researched* and what was taught became one within the naturalistic setting of this content classroom. As researcher and teacher I was not recreating the classroom for the purposes of research, but rather I was observing and experiencing what was created within the classroom, between the class, the teacher, and myself.

The Research Process

The research process began in September 1995 when I approached the classroom teacher with the prospect of conducting research in his science class. The core of the research process lasted 12 weeks, from preplanning to the last interview of the classroom teacher. I do not consider the research process over, because I still work and talk with the classroom teacher. Through these informal interactions and discussions I have gained insight into using the Knowledge Framework. The classroom teacher and I have worked together in the same school for six years and have what I would consider to be a good working relationship. We had also worked collaboratively for two months during the previous school year, using the Knowledge Framework to teach a social studies

unit. We both agreed that this collaboration had been successful, and the classroom teacher was open to the two of us teaching collaboratively and to engaging in the process of action research within his science class. The classroom teacher and I planned and taught together integrating language, content, and thinking skills using the Knowledge Framework and graphics. I explained that I intended to use unobtrusive measures to gather data and that the research would be conducted with a minimum of disruption to the day to day teaching and learning of the class, because the research would be embedded within the day to day teaching of the science class. By using the action research process, I was both teacher and researcher, roles interwoven until indistinguishable. I tried not to separate research from teaching, so that my action research truly became a form of teaching, not simply a form of inquiry (Elliott, 1991).

A few months before I began collecting data, my thoughts began to focus on what shape the research might take. I started to work collaboratively with the classroom teacher seven months before the data was to be collected. This enabled me to 'live with' the students and the teacher within the content class. Throughout these months I became known and familiar to the group of students, and likewise the students began to become known and familiar to me. I believed that this *knownness* and familiarity would contribute positively to the new understandings that would be created within the research process. These new understandings would arise from within the dynamic context of this content class.

Within These Four Walls.

The research process was embedded within the daily teaching and learning

processes of this content classroom. A 'typical' forty minute science period began with a review of what we had done in the class the period before. I asked the class to do one of three things as part of the review. Sometimes I asked each student to turn to the person next to him/her and talk about what we had done and learned the science period before. Other times I gave the students a reflection sheet and asked them to write about what they had learned during the previous science period (see Appendix B for example). Or I engaged the students in whole class discussion to review what we had learned the period before. Review times had four purposes. Firstly, I wanted to reinforce the content that the students had learned and relate that content to new content. Secondly, I wanted to reinforce the knowledge structure, related language, and related graphic that we had been working with in the previous science class. Thirdly, I wanted the students to think about and articulate what they had learned and begin to make connections between the content, knowledge structures, language, graphics, and their own learning. Fourthly, I wanted to 'tap into' the thinking of the students to see how they perceived what was being taught and what was being learned. Review usually lasted five or ten minutes, but sometimes the review time expanded to allow me and the students to further explore our ideas and understandings.

After we completed our review, either the classroom teacher or I introduced the lesson for the period. During the introduction I told the students the topic or content we were going to learn. Then, before discussing new material, I asked the students questions to elicit their prior knowledge and create a 'space' in their minds for the new knowledge. The classroom teacher and I always introduced new content with a text and a graphic (see Appendix C). The text reinforces the

students' ability to read content texts and graphic supports the students' understanding of the academic text. We explained to the students that the purpose of the graphic was to help them understand the text, and that they should use the graphic while they were reading the text. The classroom teacher and I were explicit about the purpose and value of graphics to the students' learning.

The next stage of the lesson was an activity and graphic that guided the students' reading of the text and graphic and 'forced' the students to interact with the graphic (see Appendix D). At the beginning of the unit the classroom teacher and I did not yet realise that this kind of activity was necessary to ensure that students interacted with graphics. Once we realised this through our reflection, discussion, and evaluation, this stage of the lesson became a regular component. The students worked in pairs or small groups to complete the activity. We always used cooperative groups so that the students could interact with each other to clarify ideas and understanding. As the students worked through the activity, the classroom teacher and I circulated to assist the groups. While I circulated I was able to observe how the students interacted with the graphics, the texts, the teacher, and each other. During this time I asked students questions to clarify my own understanding of what I observed.

Quite often students were not finished the activity by the end of the science period. When this occurred, the students completed the activity for homework to be handed in the next science class. From talking to the students I realised that some students completed the tasks individually at home and other students met with their groups on their own time to complete the tasks. While the classroom teacher

and I shared the responsibility for marking the homework, I marked the majority of the assignments so that I could immerse myself in the students' work to gain understandings as part of the research. I marked and analysed assignments for the following:

1. the students' use of content in the form of graphics and the form of writing;
2. the students' use of specific language that was representative of the dominant knowledge structure within the task;
3. the students' use of graphics to express their understanding of the content (see Appendix E for an example)

The marks the students received for their assignments were recorded and contributed to their third term letter grade for Science and ultimately their final letter grade for science. After the classroom teacher or I had marked the assignments, we handed them back to the students so they could see how they had done. I then re-collected the assignments and kept them as part of the research data.

A cyclical model of action research.

I used a cyclical model of action research (Kemmis, 1981 in Ebbutt, 1985) that involved planning, observing, reflecting, understanding, rethinking, replanning, and evaluating. Figure 3.0, which is adapted from Kemmis (1981, p.4), illustrates the action research process. This cyclical model of action research occurred within the process of collaboration between myself, the classroom teacher, and the students in the science class. The essence of the research was the naturally occurring process of collaboration and negotiation of meaning between myself as the ESL specialist, the classroom teacher, and the students, within the context of the content class.

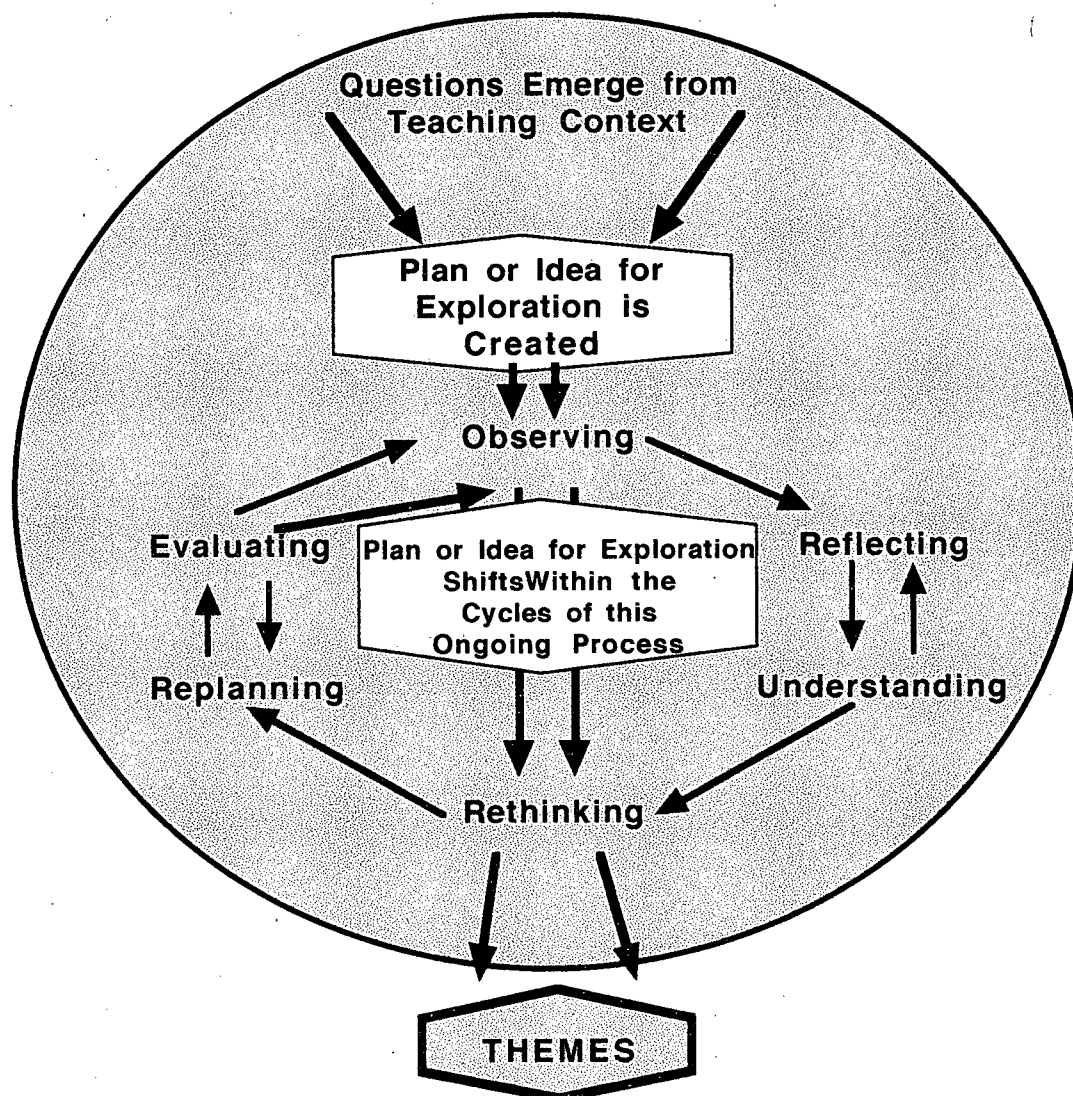


Figure 3.0
Model of Action Research

I used five methods of data collection within this cyclical process:

1. classroom observation
2. informal discussions with students and ten student interviews
3. informal discussions with the classroom teacher and two formal interviews

4. collection of student work samples

5. a testing instrument devised by myself and the classroom teacher

I will describe each method of data collection within the context of the cyclical model of action research. First, I will describe the flight unit.

Learning about flight

The majority of the data were collected during a science unit on Flight. This unit consisted of seven sections about different aspects of flight. The classroom teacher and I webbed the content we wanted to cover during the unit. Figure 3.1 is a representation of this web and the content that we covered.

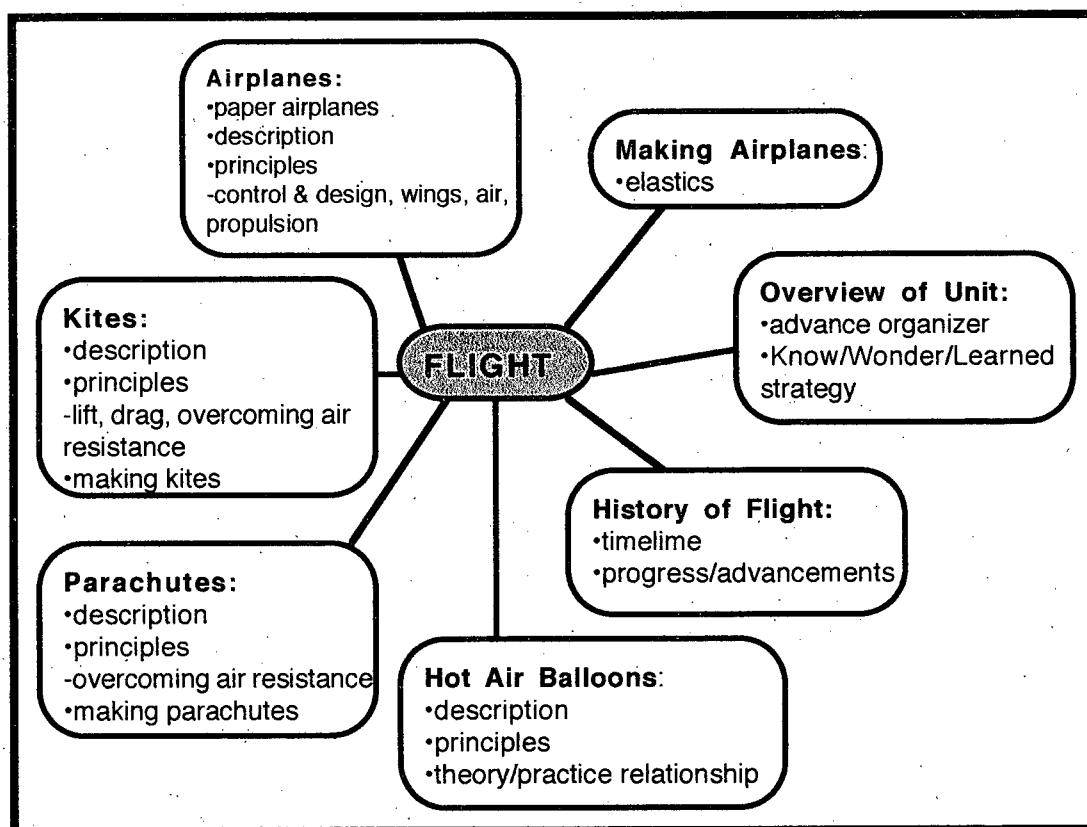


Figure 3.1
Overview of Flight Unit

We used the Framework to plan the thinking skills (knowledge structures) and the language we taught. We explicitly taught the thinking skills and the related language in our lessons and activities. The thinking skills and language of the Flight Unit are summarised in figures 3.2 and 3.3.

CLASSIFICATION	PRINCIPLES	EVALUATION
<ul style="list-style-type: none"> •classifying types of kites •classifying types of airplanes •defining terms of flight •classifying key vocabulary terms of flight 	<ul style="list-style-type: none"> •understanding cause/effect in operating a hot-air balloon, kite, parachute, airplane •understanding principles of flight •drag •lift •gravity •thrust •resistance •hot air rises •angle of attack 	<ul style="list-style-type: none"> •evaluating design plans for parachutes, kites & paper airplanes
<ul style="list-style-type: none"> •describing parts of a hot-air balloon, kite, parachute & airplane •describing the functions of the parts of a hot-air balloon, kite, parachute & airplane •labelling parts of a hot-air balloon, kite, parachute & airplane 	<ul style="list-style-type: none"> •chronological ordering of the history of flight •sequencing steps of operating a hot-air balloon, kite & parachute 	<ul style="list-style-type: none"> •choosing one design to construct a parachute, kite & paper airplane
DESCRIPTION	SEQUENCE	CHOICE

Figure 3.2
Knowledge Structures of the Flight Unit

CLASSIFICATION	PRINCIPLES	EVALUATION
<ul style="list-style-type: none"> •generic nouns •stative verbs: to be, to have, to belong •possesives: its •species nouns: kinds, categories, types 	<ul style="list-style-type: none"> •cause/effect: if...then, because, when...then, consequently •cause: is due to, is the result of, ...happens because •scale or amount: all, every 	<ul style="list-style-type: none"> •describing emotions: like, dislike, •adjectives: good, bad
<ul style="list-style-type: none"> •stative verb: to have, to be •adjectives: •relative clause: which •quantifiers: some, many •articles: the, a/an •prepositions: at, above, below, between, by, around 	<ul style="list-style-type: none"> •logical/chronological connectors: first, second, etc, next, then, during, after, finally, later, before, in the end •prepositions of time: at, about, around, towards, against, on, over, between, by 	<ul style="list-style-type: none"> •modals: I think that, I choose, can •preferences: prefer
DESCRIPTION	SEQUENCE	CHOICE

Figure 3.3
Language Within the Flight Unit

Another main objective of the Flight unit was to make the theory of flight more meaningful to students through hands-on activities. For example, when we taught this section on parachutes we gave the students background information about the parts of a parachute, the functions of these parts, and the principles behind how a parachute works. The classroom teacher and I then created a hands-on activity that required the students to apply what they had learned about parachutes to the designing and constructing of parachutes. Students then tested-out their parachutes and evaluated the effectiveness of their parachutes using the previously taught principles of flight.

Planning: Preplanning and Concurrent Planning.

As questions emerged from within the content classroom, the classroom teacher and I began the planning process. Planning took two forms, preplanning and concurrent planning. The classroom teacher and I preplanned to the extent that was possible given the time constraints we were both under. The classroom teacher was very involved in school sports activities that took place before school, at lunch, and after school. I was involved with an Action Research group that met monthly and that was also presenting at local conferences. These time constraints limited the amount of preplanning in which the classroom teacher and I were able to engage. The classroom teacher and I were able to meet to preplan what content we were going to cover in this science unit. In addition, we preplanned the first three lessons of the unit and decided who would be responsible for the preparation and teaching of those lessons. During the course of preplanning, the classroom teacher and I discussed the purpose of the research and my understandings and his understandings about content teaching, integrating

language and content instruction, the Knowledge Framework, ESL teaching and learning, the role and purpose of educational research, and the collaborative teaching process. I reflected upon this process through fieldnotes during the preplanning and through narrative writing during and after the preplanning stage.

We did the majority of the unit planning concurrently with the teaching of the unit. There were two reasons for this. Firstly, time constraints of the classroom teacher and myself made it necessary to plan as the unit progressed. Secondly, and most importantly, I anticipated that the action research process would lead to changing understandings of how teaching and the presentation of content information would occur. In turn, the changing understandings would affect the way the classroom teacher and I would present information and teach students within the content class.

The classroom teacher and I discussed these observations, new understandings, and changes informally throughout the course of the science unit. I reflected upon these discussions and my own thinking processes and observations through my fieldnotes and narrative writing.

Observing.

Observation was a part of the daily teaching and planning process. In certain instances, observation took the form of formal observation periods when the classroom teacher taught the class and I was able to make detailed observations of classroom activities (Delamont, 1992). At other times, observation occurred on a daily basis as I taught and interacted with the students and the classroom

teacher. Throughout the research process, observation of students occurred through the formal interviews I conducted outside of the Science class. The act of observing as the researcher became intertwined with my role as the ESL teacher. I was observing myself as I planned, discussed, and interacted with the students and the classroom teacher. I was a participant in the research process, just as the classroom teacher and students were participants. I recorded my observations in fieldnotes and reflected upon them through narrative writing, both during and after the data were collected.

In some instances, formal observation sessions enabled me to explore phenomena that I had observed while I was teaching or working with students. One such phenomenon was how graphics were used by the students and the teachers to clarify understanding during a task. During one task concerning parachutes, in which students were required to fill-in a chart with information from a graphic and text, a student had difficulty understanding the term "canopy". First, I referred to the graphic to explain to the student what a canopy was. Then, I used the graphic to explain the function of a canopy as part of a parachute. Next, the student and I read the section of the text that described a canopy (see Appendix F for parachute graphic and text).

I became interested in how graphics were used to clarify understanding during a task, so, during my next formal observation session, this became my focus. I was able to observe the classroom teacher using the graphic from the task and his own 'impromptu' graphic on the chalkboard to clarify student understanding. In addition, I was able to observe the process of students using graphics to clarify

their own understanding and to help clarify the understanding of the students they were working with in their learning groups.

Reflecting and Understanding

Reflecting and understanding are grouped together in this section because the two are intertwined. Reflection leads to the understanding of a situation or context (Aoki, 1992). In this exploration, reflection led me to not just a surface understanding of the events of a situation, but to a *deeper* understanding of what the events meant for me and the other participants. Through reflection I identified themes which emerged from the data collected through observation, interviews, discussion, student work samples, and the testing instrument. I used narrative writing to *look* beyond observation and occurrences to identify themes within the data. These themes became a part of new understandings about the Knowledge Framework and the use of graphics. These new understandings would guide me in reporting the results of this research.

The students were encouraged to reflect upon their understanding and perception of the teaching and learning in the science class. This reflection was done through informal discussions during class time and as a component of the written review tasks that the students were asked to complete. Each class began with a review of the task from the previous science period. As part of the review I would often ask students questions designed to help them reflect upon their learning experiences:

What kind of language did we learn last period?

Why do you think we learned specific language?

Was there anything that Mr. -- or I did that helped you understand the work?

Was there anything that you or your partner did to help you understand the work?

Why did we use a diagram to study the parts of a parachute?

After a task on parachute design, I gave students a reflection sheet on which they answered two questions about the task:

Think about the three parachute designs you drew. Why do you think we drew pictures of parachute designs before we made parachutes?

Did the pictures of parachute designs help you to make your parachutes?

How? Why?

In addition, during a formal interview conducted outside of class time, I asked ten students questions that helped them to think about how graphics affected their learning and understanding of content material:

Think about the work you have been doing in science class. Is there anything that makes the work easier for you?

Is there anything that Mr.-- or I could do to make science easier for you to learn?

During the interview the students were asked to look at a graphic that they had seen earlier in the school year. I asked them questions about the graphic:

What does this visual/picture mean?

Have you seen it before? Where?

What helped you to decide the meaning of the picture?

Did it help you to understand the topic? How?

I interviewed the classroom teacher on two occasions, once at the end of the science unit and again at the end of the following school year (McMillan & Schumacher, 1989). One purpose of these interviews was to encourage the classroom teacher to reflect upon how the Knowledge Framework and graphics

were used within his class. I thought it important to interview the classroom teacher one year after the unit had been taught, to see what *long-term* effects the research and collaborative process had had on his teaching practice. An underlying theme of action research is educational change (Elliott, 1991). My intent was to find out if change continued for the classroom teacher after my presence as the support teacher and as the researcher was removed from the content classroom.

Rethinking and Replanning.

Rethinking and replanning were an integral part of the action research process, as they directly affected the changing of teaching practice. New understandings led me and subsequently the classroom teacher to rethink how information was presented to the students and how the students themselves perceived how information was presented to them. This rethinking or changing understanding led the classroom teacher and myself to replan student tasks, activities, and to change the format of material that was presented to the students. I recorded this process in fieldnotes and the narrative writing. I revisited the fieldnotes and narrative writing at different time intervals after the data collection period. Each time I revisited the fieldnotes and narrative I brought with me new experiences and understandings that helped me to gain new understandings and insights into the research process.

One example of how rethinking and replanning affected our teaching, concerned the way we presented graphics within tasks. At the beginning of the unit the classroom teacher and I presented a text coupled with a graphic to the students

with the instruction, "Use the graphic to help you understand the text." While reading the text, students asked the classroom teacher and myself for clarification of key vocabulary in the text. When we asked them if they had used the graphic for clarification, they said that they had not used the graphic. The classroom teacher and I discussed this phenomenon and rethought how we presented graphics within a task. We consequently replanned our tasks so that the nature of the tasks required the students to interact with the graphics. An example of one such task was *Parts of an Airplane: Description and Function* (see Appendix G). This task involved two graphics: a labelled diagram and a note-taking chart. This task required the students to read the text, take notes on the parts of an airplane, and draw a picture/graphic of each part of an airplane highlighted in the text. The drawing component of the task required the students to interact with the labelled diagram of the airplane as well as the text.

Evaluating.

Evaluation of what I rethought, replanned, and understood was ongoing throughout the action research process. Evaluation also extended beyond the data collection part of the research. As I re-visited the data, fieldnotes, and narrative writings, I continued to evaluate the understandings that I had developed to that point. Through informal discussions during the teaching of the unit and formal interviews after the unit had been completed, the classroom teacher became a part of this evaluation process. The classroom teacher and I would "touch base" about what we had done, what we were doing, and what we were going to do. These were usually short discussions or planning sessions that we fit into our schedules whenever possible. Our discussion ranged from incidental,

Did you notice when . . . ?

It's interesting when . . . ?

to more complex issues and observations,

This isn't working. How are we going to change it?

What do you think about how . . . ?

That worked really well. How can we maintain that success?

I thought it was important that the classroom teacher become a part of this evaluation process, to take ownership of and part of the responsibility for the ideas and understandings that were being created as part of the collaborative action research process. I hoped that this would facilitate change in teaching practice. I felt it was important to move beyond doing to *thinking* about and *reflecting* upon what we did.

The Research Process Revisited

At this point it is important to revisit the cyclical process of action research (see Figure 3.0). I revisited the planning, observing, reflecting, understanding, rethinking, replanning, and evaluating as I developed new insights and understandings about what was happening within the content class. This revisiting was ongoing and as the research progressed the different aspects of action research became automatic in the way I approached daily tasks. Action research became a form of teaching and a way of thinking about what was happening within the content classroom.

A few words about time

As the research progressed, I began to feel the pressures of time. Time acted upon the research process as a constraint. As the last month of the research was June, activities, assemblies, and school functions began to eat away at the time I was able

to spend with the content class. The forty minute science periods began to feel very short. Some questions that arose from my observations and reflections were left unanswered because there was no opportunity to seek clarification from the students and the classroom teacher. I would have liked to devote more of my school-day time to dwelling with the students and teacher within the content class, but I had my commitment to other students within the school. Time became a frustration that I had to accept within the naturalistic school environment.

Chapter Four

The Research Findings:

Emerging Themes, Insights From Within a Content Class

Introduction

In this chapter I report on the findings of the study by exploring eight themes that emerged from the data that I gathered. My writing about these themes represents both the findings and the discussion of those findings within the same *space*, as the separation of the findings and the discussion would not represent my journey of learning within the action research process. I describe a theme and then present evidence from the data to support the theme, to create a context for the theme, and to create an impression of how the theme emerged. At this point it is important to note that the themes represent what occurred within the *life* of the content class and among the students, the classroom teacher, and myself as the English language support teacher. The themes emerged from the interaction between the participants within the content class. This interaction took many forms, from examining students' work samples, observing the progress of an activity, evaluating the success of an activity, to discussions with students and the classroom teacher. I developed the themes through narrative writing at different time intervals after the data was collected. The eight themes that emerged from my research are not completely distinct and separate. The themes are connected and interwoven into the landscape of the content classroom in which they dwelled and from which they emerged.

About Themes.

It is important for the reader to understand that themes are "an individual's thoughtful attempt to reflect upon personally lived experiences" (Aoki, 1992). They are not meant to be generalizable to other situations, although a reader may have had similar lived experiences. Themes are part of a process of creating understanding about lived experiences and as such are rooted within the experiences and understandings of the writer. The themes in this chapter are not a final outcome of my research, but are part of a movement forward in my thinking, toward developing understandings.

As the reader reads through these themes, I believe that he/she will interact with this text in a thoughtful manner. The reader brings his/her understandings and experiences to the text and through reading interacts with the text and re-creates the text. In this way the text is meaningful to the reader.

Theme One: A Continuum of Usage and Understanding

When I looked at student work samples I began to see a pattern emerging with regard to how students used graphics in their daily schoolwork. I identified a continuum of usage and understanding of graphics within this science class. This is perhaps not surprising when considering the dynamics of the class. Students were grouped according to age and grade level and not streamed by perceived ability. As I stated earlier, this particular class had a wide range of reading levels, which would suggest different levels of academic English language development. I began to wonder if students who used graphics effectively were at a higher level

of academic English language development. As I explored this question I began to realise that this continuum was not simply a reflection of academic English language development within this content class. Figure 4.0 summarises 10 students' graphic scores over seven student tasks.

Participant	CTBS Score	Age of First English Instruction	GS* 1 06/6	GS 2 06/6	GS 3 06/9	GS 4 06/13	GS 5 06/20	GS 6 06/21	GS 7 06/23
CF	7.4	3	15	5	absent	41	28	8	16
AN	7	5 or 6	17	4	18	39	27	7	15
YL	6.7	5	14	6	13	34	27	9	absent
LM	6	6	13	5	absent	19	26	8	12
JK	5.7	6	17	2	6	20	28	7	10
SS	5.7	5	9	4	6	11	17	7	14
AL	5.5	6	11	6	6	26	26	7	absent
KS	N/A	5	13	3	12	23	24	6	14
AH*	< 4.0	9	15	5	12	26	24	7	absent
AL*	< 4.0	8	14	7	9	25	18	5	12

Figure 4.0
Range of Student Scores on Tasks That
Involved Student Produced Graphics

Notes:

*ESL Reception Class student

*GS= Graphic Score

It became apparent that within each task there was a range of scores that reflected a continuum of usage of graphics (see Appendix H for student work samples along the continuum). I based this range upon the amount of information that was contained within the student produced graphic. Each graphic was scored using the following criteria:

- one point for each label used in a descriptive graphic (diagram)
- a three point scale for the detail of the drawing:
 - three points = detailed drawing
 - two points = some details
 - one point = few details, hard to understand

There was a small tendency for students with higher reading scores to use graphics more effectively. For example three students (CF, AN, and YL) with a graded reading scores of 7.4, 7, and 6.7 respectively, had consistently higher graphic scores over six tasks. There were, however, many exceptions to this tendency. For example, within a task there were always students with low reading scores who scored higher than students with high reading scores. For example, on task GS 1, student JK with a graded reading score of 5.7 received the higher graphic score than student CF with a graded reading score of 7.4. In addition, two of the ESL reception class students, AH* and AL*, with reading scores more than two years below grade level did substantially better than student SS with a much higher graded reading score of 5.7. In some instances, students with above grade level reading scores scored substantially lower than students with below grade level reading scores. For example, student AL* reading more than two years below grade level received a graphic score of 7, whereas student AN with a

graded reading level of 7 received a graphic score of only 4 on the same task.

I began to wonder about these significant exceptions. I began to look beyond reading level and task scores to the individual students involved. I asked myself, "What was it about these students that affected their performance?". Two of the ESL reception class students scored higher than I thought they would on most tasks. I realised that these students had many and varied experiences using the Framework and graphics within the context of their ESL Reception class. This suggests that length of exposure to and amount of interaction with graphics could positively influence the graphics produced by students and minimise the negative influence of low academic reading levels of students. Two students from the grade 6 class who were reading below grade level, consistently scored high on tasks involving graphics. This suggests that other factors related to student success at school (i.e. what makes a *good* student) may affect how successfully students use and produce graphics. Such factors may be those that influence student success in all aspects of schoolwork.

I feel there are many unanswered questions regarding this continuum of usage of graphics. Indeed, this continuum that I observed may vary from class to class. What appears to be certain is that all students within this science class were able to utilise and produce graphics within the context of their daily science tasks, as illustrated by the work that the students produced.

Theme Two: A Tensionality Between Text and Graphic in Student Responses

As the classroom teacher and I created tasks to support student learning of

content, we made a conscious effort to include a graphic component. Typically each task included a reading component, a writing component or note-taking component, and a graphic component (including both teacher produced and student produced graphics). When extracting information from a text, we asked students to use a previously taught note-taking technique. When a task required that students produce a graphic, we instructed the students to label their graphic. Some students used note-taking but others reproduced full sentences from the text. Some students utilised labelling in their graphics and others drew graphics without labels, as I discussed in Theme One. When I examined completed student tasks, I began to see a tensionality between student written responses and student graphic responses within each task. It appeared that some students relied more heavily on graphics to represent their knowledge in a task that combined graphic and written responses. I wondered if this relationship between text response and graphic response was related to level of academic English language development.

As I continued to analyse student tasks, it appeared that those students with lower levels of academic English language development relied more heavily on graphics to represent their knowledge. It seemed that students used graphics to 'fill-in' the content that they were not sure how to express with their writing. Students who had a high level of academic English appeared to use graphics to complement their writing. All students used graphics as a means of representing their knowledge, because the classroom teacher and I created tasks that required the students to do so. However the quality and sophistication of the students' graphics varied, as I have discussed previously in Theme One. The tensionality

between student produced text and student produced graphic appeared to vary according to the student's ability to represent his/her knowledge using written academic English.

As I wrote about this tensionality or relationship between text and graphic in student work, my thinking began to shift from the perspective of the student to the perspective of the teacher. As the teacher, I was relying on the information represented in the student's graphic to determine if the student understood the content when the student's writing was limited due to low academic English language proficiency. With those students who were able to represent their understanding clearly in their writing, I relied less on their graphics to determine whether they had understood the content. Just as the students appeared to place different levels of emphasis on the use of graphics and text in the way they represented their knowledge, so did I, the teacher, place different levels of emphasis on student graphics and texts as I marked student tasks to determine student understanding of content. I was not sure if the tensionality between text and graphic existed from the perspective of the students, or if this tensionality was part of my perception and need as a teacher marking students' work.

As my understanding and thinking within this theme evolved, I wished I had clarified and explored this observation with the students themselves. I wondered if the students were conscious of this tensionality between graphic and text. Did students see this reciprocal relationship as I had? Or rather, did my perspective as teacher and how I relied on the students' texts and graphics to determine their understanding of content, lead me to observe that the students were doing the

same? Unfortunately at this point in the research process I am unable to ask the students these questions. As I continue to work with students using the Knowledge Framework, I will be able to focus on this question.

Theme Three: Designing Tasks to Encourage Student Interaction With Graphics

From the beginning of the unit the classroom teacher and I used graphics to support the presentation of content texts. We coupled content texts with graphics, with the text at the top of the page and the graphic at the bottom of the page (see Appendix C). We gave instructions for students to look at the graphic and then read the text. We also told the students that the graphic was there to help them understand the text. As I observed the students while they read the texts in class, it appeared that they did not always use the graphic to help them understand the text. This appeared to be the same when they worked with a partner or individually. When I asked students if they had looked at the graphic before, during, or after they read the text, many of the students said they had not. This finding supports Tang's finding (1991) that students generally do not utilise graphics, even when a graphic is on the same page as the text it summarises.

I began to realise that the classroom teacher and I needed to design tasks that supported the students' interaction with graphics, beyond simply saying "Look at the graphic before you read the text." In one task about parachutes, we gave the students a text describing the parts of a parachute and their functions coupled with a labelled diagram of a parachute. After the students had read the text, the classroom teacher and I replaced the labelled diagram with an unlabelled diagram (see Appendix D). The students' task was to label the diagram of the

parachute by reading the text of the parachute. We asked students to work in partners so that they would be able to negotiate and interact in order to draw information out of the text. I observed students actively using graphics to understand content texts. As I later realised, creating tasks that encouraged students to interact with graphics was a crucial part of changing the students' perceptions about the role and value of graphics in their content learning. These observations support Tang's (1991) finding that when teachers familiarise students with the role and use of graphics, students begin to understand the importance of graphics as a source of information and a way of representing information.

Re-visiting the action research process

The events described above illustrate the nature of the action research process. The action research process is a process of reflection, understanding, interaction, and change which emerges from within the classroom and those who dwell within the classroom. From within the action of the classroom emerge the questions. The action of the classroom weaves the thinking and research and teaching together, resulting in an ever enlarging tapestry of change and development. A change in teaching practice, teaching materials, and teaching wisdom. As Elliott states, "Action research integrates teaching and teacher development, curriculum development and evaluation, research and philosophical reflection, into a unified conception of a reflective educational practice" (1991, p. 54). The classroom teacher and I were immersed in this educational practice.

We began with an idea/question:

- *would graphics enhance student learning of content texts?*

We then observed what happened in the classroom when we implemented this idea:

- *students did not always interact with graphics even if the graphics were on the same page as the text that they summarised.*

Next, based upon what we had observed in the classroom, we gained new understanding into the use of graphics to support content texts:

- *we needed to design tasks that required students to interact with graphics.*

We took this new understanding and changed the way we taught the students:

- *we designed tasks that required students to interact with graphics.*

We then observed the impact of this change within the context of the content classroom:

- *students interacted with graphics and began to recognise the value of graphics in their content learning.*

The classroom teacher and I agreed that creating tasks that required students to interact with graphics had a positive effect on students' learning of content, so we used this knowledge to change our teaching. We continued to engage in the process of observing, interacting, evaluating, and changing within the content class.

Theme Four: A Cyclical Process of Interaction Between Text and Graphic

Once the classroom teacher and I integrated theme three into our daily teaching practice, through the way we designed tasks and instructed the students to complete tasks, new possibilities for understandings were open to us within the content class. I began to observe a pattern in the way in which students interacted with graphics as they read content texts. A cyclical pattern or process began to emerge. This pattern was easily observable as students often worked in pairs or in groups of three. Similar to the findings of Reyes and Molner (1991), pair or small group cooperative work usually elicited discussion and negotiation of meaning among participants. This discussion and negotiation enabled me to *listen* to the students as they engaged in the cyclical process of interaction with the text and the graphic.

Students would begin by reading the text. As they read the text, a question would arise from the text, for example, questions regarding key vocabulary, definitions, and description. Students would then seek clarification from the graphic. Once students had found answers for their question from interacting with the graphic, they would return to reading the text. This process is illustrated in figure 4.1.

After observing the students engaged in this process, I spoke with a few of the students to discover their perceptions of how they interacted with the text and the graphic. I started with an open question:

"What did you do when you read this text?"

I was referring to a text describing the parts of a parachute that the students had worked with previously. The students were quite aware of what they did as they

read the text. These were some student responses:

Sometimes you read it you don't understand. When you look at it you understand how it starts. ("it" refers to the graphic)

if I don't understand I look at the pictures. Or I ask my friend.

I have a picture so I know what was this say.

... when I read it some of the parts I don't know, don't know where it goes . .

. I look at the diagram it much easier to understand what does it mean.

If I read it I could just look at it to know where the parts are for the parachute, that matches the sentence.

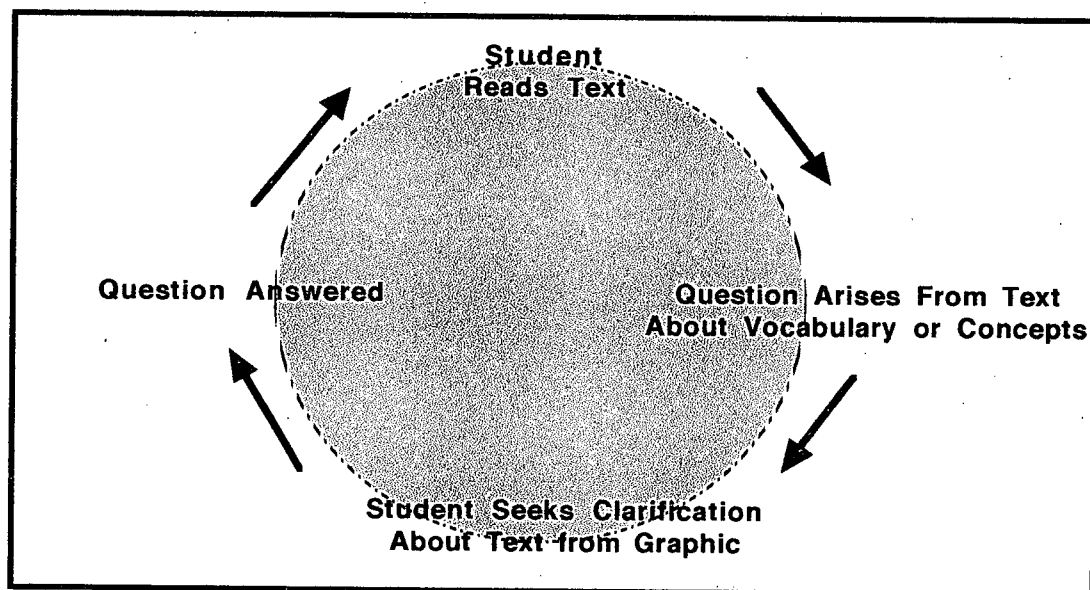


Figure 4.1
How Students Used Texts and Graphics:
A Cyclical Process

My discussions with the students confirmed my own observations of 'what was going on' in this classroom. Most students were not only aware of the process that they went through to understand content texts, but they were able to clearly put into words their understanding of this process. These observations confirm and extend to an elementary setting the findings of Early and Tang (1991), "that using key visuals to present content-area knowledge can increase secondary ESL students' ability to read content text" (p. 42). Further, these observations give insight into the thinking processes of the students as they interacted with graphics and text.

Reflecting upon the role of students within the action research process

I began to think that maybe as teachers, we did not talk with students as much as we could or as we needed. I began to realise that the students were an integral part of the research process. Not just as participants but as researchers and corroborators. The students' perceptions and observations confirmed or challenged my perceptions and observations. Talking to students about what they experienced helped me to confirm that students engaged in a cyclical process of interaction between text and graphic, as I discussed in Theme Four.

Theme Five: A Developing Awareness of Graphics -- What Graphics Are and What Graphics Can Do

The classroom teacher and I had worked collaboratively and had used graphics in our teaching with this class since the beginning of the school year. The students had worked with graphics in their science class since September, seven months

before our formal research process began. The classroom teacher and I had used graphics as a method of supporting student learning of content, without participating in the kind of reflection that became a part of the action research process. We did, however, explain to students why we used graphics in our teaching. The students had not been asked to think about or reflect upon the use of graphics in their schoolwork. The first time I asked the students to think about graphics was during the interviews I conducted with 10 of the students from the science class. I used a "judgment sampling" (Burgess, 1984, p. 55) based on the range of students within the content class including the three students from the ESL reception class. I used the students' CTBS reading scores to establish this range criteria. I felt it was more important to maintain this range of students than to pick students at random, because of the possible impact that language development might have on the students' use of graphics within the content class. (Tang, 1992). The interviews began in April, at the beginning of the action research process.

The evolution of the interview.

At the beginning of the action research process, my understanding of 'what my research was about' was quite narrow. The "general idea" (Lewen in Elliott, 1991, p.69) of my research was to explore how graphics helped students learn content material. This narrowness was reflected in the first interviews I conducted. The interviews were spread over a two month period. The last interviews were conducted well into the action research process. Therefore, the focus of these interviews expanded to include questions that had emerged during my observations

of the content class and my reflection upon those observations. As Elliott (1991, p. 70) argues that "the general idea should be allowed to shift", my general idea had shifted because of my experiences within the content class.

It appeared from the interviews that the students were quite aware of the value of graphics within their content learning. This observation supports the findings of Tang (1991) and Grant (1995), that when the value and use of graphics is modelled by classroom teachers, students begin to develop an awareness of the impact graphics can have on their own learning. Five out of ten students identified graphics as having a positive effect on their understanding of content texts within the science class. In response to this question (see Appendix J for a table of student responses), only five out of ten students identified graphics as having a positive effect on their understanding of content texts within the science class.

Think about the work you have been doing in science class. Is there anything that makes the work easier? How?

However, during the course of their interviews, all ten students identified graphics as having a positive effect on their learning in science class. Graphics were identified as one factor, among others ("ask a friend", "use the dictionary", "ask the teacher", "work with a partner", "listening carefully", prior knowledge, "know more about it"), that made learning easier for students. The students' responses to the following question about a frog life cycle graphic that they had used previously in their science class, indicated that this graphic that the classroom teacher and I had used had helped them in their content learning. The frog life cycle graphic had

arrows and pictures to illustrate each stage of the life cycle. The graphic itself did not contain any words, but was coupled with a text when we used it during a Life Cycle unit. When I used it as part of the student interviews, I used the graphic without the accompanying text.

Question: When you saw this in your science class, did it help you to understand the topic?

Answers: Yeah, because this is the no words to see it on this paper. I have a picture so I know what was this say.

Yes, by the pictures.

Ya. It shows it better. Like I can't understand it if you write it. Like it doesn't describe it very well and the picture shows how it goes.

Yes, because it helped because we write a paragraph about the frog life cycle and we drew a life cycle of a frog and we wrote steps about the frog's life cycle.

Because I know the words.

I believe that these responses reflect a basic level of understanding of how graphics helped students to learn content. A basic understanding that appeared to be representative of a *beginning awareness* of what graphics are and what graphics can do for students within the area of content learning. This beginning awareness emerged from within a classroom environment that valued graphics. During the time that the interviews occurred, the value of graphics was demonstrated by the classroom teacher's and my behaviour. For example, the students observed the classroom teacher and me using graphics in our teaching. This included the explicit teaching of how to use graphics and their corresponding

language structures, and designing tasks that required students to interact with graphics and produce their own graphics.

The students were beginning to expand their experiences with graphics, but the ownership of the knowledge of the value of graphics was still in the hands of the classroom teacher and myself. The students did not *own* this knowledge, because they had not created this knowledge for themselves through the process of reflection. Throughout the unit students began to *own* this knowledge about graphics as the classroom teacher and I encouraged them to reflect upon the value of graphics within their content learning.

Toward the end of the science unit, student reflection became an integrated part of the ecology of tasks within the content class (see Appendix B). For example, a quiz on parachutes included the question:

Think about the work we have been doing about parachutes. What has helped you to understand the topic of parachutes?

Some student responses to this question appeared to reflect a higher level of awareness of the value and role of graphics. Part of this higher level of awareness was evidenced in the language that the students used to express themselves and in the ways the students used graphics to enhance their learning.

The diagrams that we looked at and drew.

The sheet describes the parts of a parachute and how a parachute works. It also has a picture of the parachute and it is label.

The label, picture help me understand some of the words in the paragraph and show me how the parachute works.

The words in the paragraph also help because it explains more than the labelled picture.

I look at the picture to understand the topic. I know some hard word in the worksheet that we draw pictures, and they give me the word.

... the diagram which makes me understand perfectly, and the description and principles of the parachutes. . .

The thing that helped me is the diagram of the parachute because when I read the paragraph I sometimes don't get what it means so when I looked at the picture it helped me alot.

Some students' responses, in addition to referring to graphics, mentioned other aspects of instruction that helped them understand the topic.

the worksheets we have done and by the teacher explaining about the parachutes

Many things helped me to understand the topic parachutes. The sheet that has the Description and Principles helped me alot. The sheet describes the parts of a parachute and how a parachute works. . .

The performance variables help me understand the big words that I didn't understand before.

The last thing that helped me understand was the part where we were making the parachute."

"The words in the paragraph also help because it explains more then the labelled picture.

and my family can help me know about the parachutes how to work

All but one of the student responses mentioned graphics as helping them understand the topic parachutes. It appeared that over the course of the school year (September to June) students developed a growing awareness of the different roles graphics played in their content learning and the value of graphics in their understanding of science content. I believe that vital to this awareness was student reflection upon the role and value of graphics. It appeared that this reflection enabled students to take ownership of this knowledge, as they created new understandings about graphics and their content learning.

Theme Six: A Shifting of Thinking ~ ~ the Decentering of Text

When I looked back on my observations throughout the research process and beyond the research process to the entire school year, I noticed a shifting of thinking for the students and the classroom teacher and for myself, the teacher researcher. This shifting of thinking was intertwined with the growing awareness of graphics explored in Theme Five. Emerging from our experiences within the classroom, our thinking, as participants within these classroom interactions, began to shift. A shift from what we thought to be 'true', to what we were beginning to understand might be. The shifting of thinking revolved around how we, the students, the classroom teacher, and I, perceived graphics within the context of the content classroom. Our growing awareness of graphics began to *decenter* our perceptions of text.

As the teacher researcher, I began the research process focusing on text. Although my research focus was on graphics, my starting point was content text. Text was central to my planning of student tasks. I started with text and then

created a graphic to represent the dominant knowledge structure within the text. I started with text and then created a graphic that would help students take notes from a text. When creating tasks in which students were to represent their knowledge of content, my focus would often be to use graphics to support student writing of academic texts. As the unit of study progressed, I began to *decenter* text. The various ways I could use graphics began to decenter text. I did not feel the need to always couple graphics with text. Graphics could 'stand alone' within a task or activity, as a means of learning content, applying content knowledge, or representing content knowledge. For example, in one task in which students were required to design three parachutes, drawing and labelling designs were the major focus of the task (see Appendix J). Graphics did not become more important than text, but emerged to co-exist with text within the content classroom.

Throughout the research process the classroom teacher began to experience a *shifting of thinking* about text and graphic. Initially, he used graphics in his teaching because we were working together and I used graphics. From our conversations it appeared that he was willing to try "new" ways of presenting information because he trusted and respected me as a colleague and because of our experiences using graphics the previous year. As we proceeded to plan, teach, and talk together the classroom teacher's understanding and perception of graphics changed. The use of graphics emerged as an integral part of his teaching. At the end of the formal data collection process which was also the end of the school year, the content teacher made the following comments:

... a lot of it we do without thinking about it anymore. We just make sure that we add some sort of visual, so that it helps support what we're teaching.

His traditional ideas of text and teaching became *decentered* as graphics began to weave their way into the "emergent curriculum of change" (Elliott, 1991, p. 17) of the content class. When I asked the classroom teacher how graphics had affected the way he taught, he answered:

I think I think about it more. Where in the past I might have just given them a set of questions and answers and expected that. I think I'm more aware of the uh potential to use a diagram or some type of illustration, so that they have another, uh, forum to show their knowledge.

For the classroom teacher and for myself, this shifting of thinking and this decentering of text has changed our practical wisdom about teaching and learning. Through our experiences in the content classroom and our on-going reflection upon those experiences, we were able to create an *emergent theory* that informed our teaching practice.

Theme Seven: Using Graphics Within a Cluster of Tasks Within the Content

Classroom

As my awareness of graphics expanded, I was able to observe graphics in many aspects of the content class. The classroom teacher and I used graphics within the cluster of tasks that we used in this content class. Figure 4.2 illustrates this cluster of tasks.

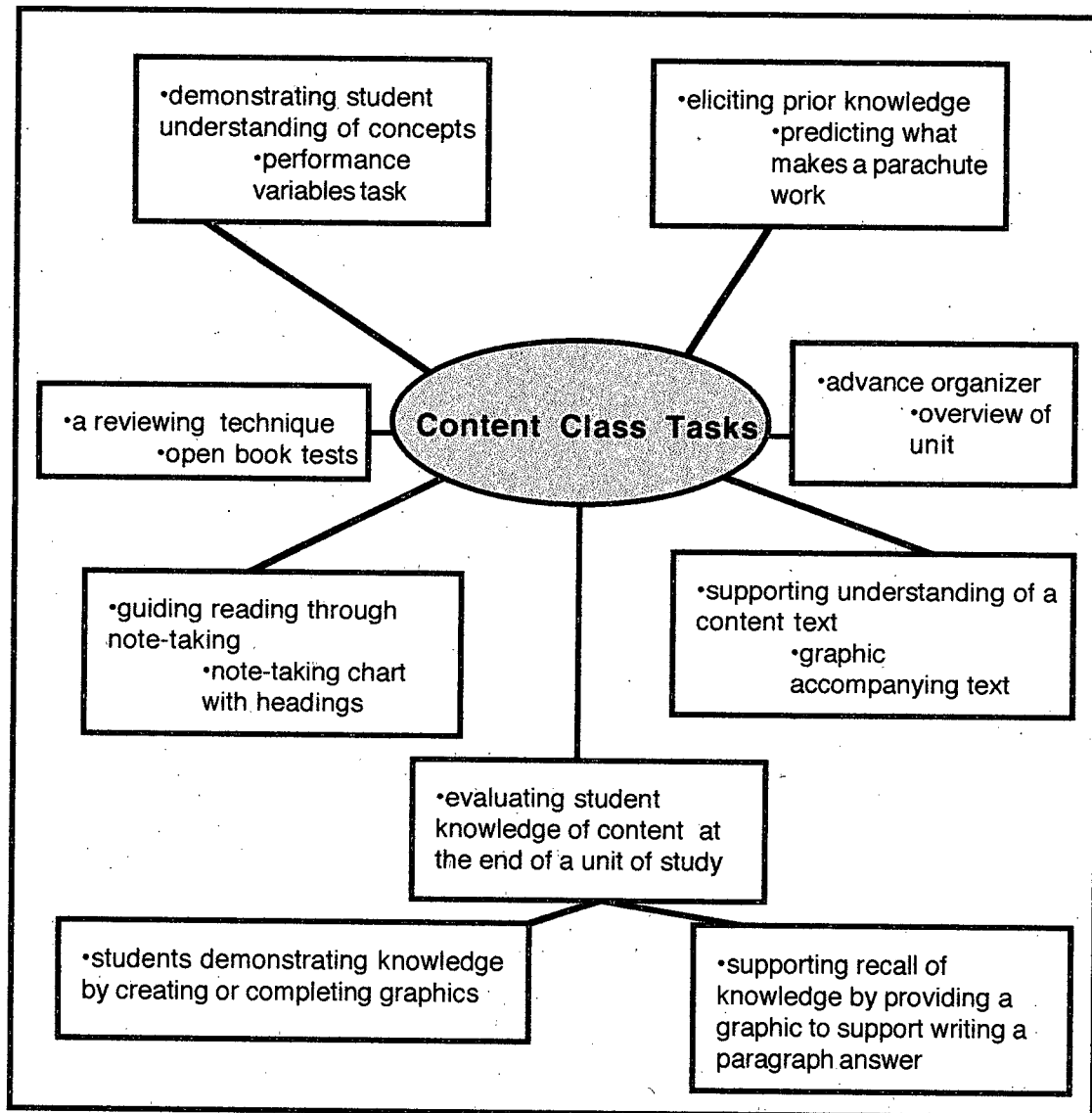


Figure 4.2
Cluster of Tasks Within the Content Class

I related the cluster of tasks to three major applications of key visuals.

1. Generative--to promote language generation related to content
2. Representative or explanatory--to increase content understanding
3. Evaluative--to evaluate content and language understanding (Early, 1990, p.570)

Not all tasks fit discretely into just one of these applications. Rather, I noticed that some tasks could have dual or multiple applications. The task of guiding reading through note-taking was generative, because students were required to write content information in a note-taking chart. At the same time, this task was explanatory, because the structure of the graphic assisted students in accessing the text. This task was also evaluative, because it required students to draw a graphic that represented their understanding of the text (see Appendix L for an example of a note-taking task).

I believe that the classroom teacher and I were better able to evaluate the students' understanding of content because the note-taking chart required the students to represent information in textual and graphic form. The students were not able to simply copy information from a text, but rather had to match the information from the text to the corresponding information in the graphic presented with the text, and reproduce that information in the note-taking chart in writing and in the form of a graphic. In Figure 4.3, I have summarised our content class tasks as they relate to the applications of key visuals.

Generative	Representative or Explanatory	Evaluative
<ul style="list-style-type: none"> •eliciting language related to prior knowledge of content •supporting the recall of knowledge and the language used to express that knowledge by providing a graphic to support writing a paragraph answer on a quiz or unit-end test •writing notes in a note-taking chart •reviewing content and the language used to express that content during an open book test 	<ul style="list-style-type: none"> •advance organiser as an overview of a unit •supporting understanding of a text by combining a text with a graphic •guiding reading and note-taking with a note-taking chart 	<ul style="list-style-type: none"> •students demonstrating knowledge by creating or completing a graphic in the context of a unit-end test •assessing student understanding of content within a note-taking activity by requiring the students to represent their knowledge in written and graphic form •students evaluating their own knowledge through open book review tests •evaluating student understanding of concepts

Figure 4.3
Content Class Tasks as they Relate to
Three Major Applications of Key Visuals

Theme Eight: Changing Teaching Practice

An underlying purpose of my research was to create an atmosphere within the content classroom that would encourage a change in teaching practice (Santa, Isaacson, & Manning, 1987), that would in turn, provide equity of educational opportunity and outcome for ESL learners. While I worked with the classroom teacher I observed, through our formal and informal discussions, a change in his understanding about the Knowledge Framework and the use of graphics within

the context of his content class. In an interview at the end of our collaborative teaching unit, some of his thoughts are reflected in the following statements:

Q: Would you use graphics in future teaching?

C.T.: Uh huh, definitely.

Q: So could you tell me then why you would use graphics in future teaching?

C.T.: Well I think in the past two years, using more and more of it, I see that the kids are. . . I think it helps them organise their information that they're getting. Uh, and I think that its another way for them to express their understanding. Uhm, its. . . its probably the first step that we can take before we do things like bring in guest speakers and bring in videos and films.

With simple illustrations or graphics . . . that we're adding that much more to the learning materials that we offer to them.

These comments illustrate that change has taken place for the classroom teacher. He has changed the way he presents information to students and further, he has developed an understanding about how graphics enhance student learning by helping them organise information and express their understanding of content. The classroom teacher had developed a practical wisdom about the Knowledge Framework and graphics.

I think I'm more aware of the uh potential to use a diagram or some type of illustration, so that they have another, uh, forum to show their knowledge. . . I know when I study for something, if you just have a bunch of words in front of you it might not mean very much, but if you have visuals to make the connections.

The classroom teacher was aware of the visual use of graphics. However, he

regarded graphics as only visual aids that supported student understanding of content. Although he referred to visuals as helping make connections for the learner, he appeared to not fully understand graphics as representations of knowledge structures.

The classroom teacher's developing practical wisdom led him to seek out new opportunities for learning. During the summer following the research process the classroom teacher enrolled in a Vancouver School Board Summer Institute called The Framework for Teaching and Learning. The Framework for Teaching and Learning is an approach to teaching based on Mohan's (1986) Knowledge Framework. I believe that the classroom teacher's independent endeavour to gain further understanding of the Knowledge Framework augured well for long-term change in his theories about teaching and learning. This long-term change was further evidenced by the classroom teacher's responses to questions I presented to him nearly two years after the formal research occurred.

Q: Has your experience collaborating with the English language support teacher affected your teaching?

*CT: •more thought about different styles of teaching and learning
•closer look at teaching "language" within content enabling students to develop deeper understanding
•language arts becomes a common theme in content areas
•quality of written assignments and communication of understanding is greatly enhanced therefore criteria setting can be adjusted to fit*

Q: Has your thinking about teaching changed as a result of the

collaboration process?

CT: •awareness of the language development required for ESL students to be able to function in regular classroom

•learning strategies taught are just as if not more important than content, enables the learner with tools and strategies he/she can apply in self learning

Q: Has your thinking about learning changed as a result of the collaboration process?

CT: •providing various ways information can be presented gives learners more ways to understand and synthesise material

•how and what students learn can't be assumed and using organisers directs and helps students to learn in content areas

These comments appear to indicate how the classroom teacher has made connections between language and graphics and how he considers the Knowledge Framework a learning strategy related to the thinking processes of students.

I continued to work at the same school as the classroom teacher and had many opportunities to discuss and observe the use of the Knowledge Framework. In a sense our collaboration continued because we continued to share our understandings about graphics and the Knowledge Framework. About a year and a half after the research process, the classroom teacher was working with me at a meeting. We were looking at the "Integrated Resource Package" (IRP) for science. We began discussing how we evaluate content tasks. The classroom teacher related how he was struggling with balancing the evaluation of content knowledge and the evaluation of language. On one level, I thought of this

conversation as representative of the classroom teacher's continued developing of understandings about the Knowledge Framework. On another level, I was struck by the interaction between the classroom teacher and myself. We had a shared philosophy (the Knowledge Framework) and sense of collegiality which enabled us to communicate and explore new ideas (evaluating content and language within tasks). Schecter and Ramirez (1992) report similar feelings about collegiality on the part of teachers who were involved in a teacher research group, "It's nice to come to a group that understood about what you were going through" (p.199). The classroom teacher and I were our own informal teacher research group.

As change occurred for the classroom teacher, change occurred for me also. I had used the Knowledge Framework in my teaching for about four years. I had taken professional development and university coursework that dealt with the theoretical aspects of the Knowledge Framework. I had begun to use the Knowledge Framework within an action research orientation, focusing on ways to use the Knowledge Framework in different areas of my teaching (ie. reading groups, thematic units, math instruction, presenting stories/literature to students). However, I had not had the opportunity to focus intensely on the use of the Knowledge Framework and graphics within a classroom. The research process I have described in this paper, enabled me to focus on this issue. This intense focus opened me up to possibilities for new understandings about teaching and learning using the Knowledge Framework and graphics. These new understandings about teaching and learning came together into an personal theory of evolving practice (see Figure 4.4). This theory of practice has had direct

impact on how I teach and interact with students.

Although I believe a great deal of positive change did occur for the classroom teacher and me, there were also some negative or difficult aspects of the action research process. The classroom teacher identified "time" as problematic within the process. Not only "finding time to collaborate and plan instruction", but also time in the sense of "less freedom in timetable in order for ELST to plan time spent in class" and "sharing my [the classroom teacher's] time with my class". The classroom teacher's concerns about "time" are similar to those of some of the teachers who participated in the Vancouver English-as-a-Second Language Pilot Project during the 1990-1991 school year (Dunn, VSB, 1992). This Pilot Project involved both teacher collaboration and implementing the Knowledge Framework.

The change that occurred for the classroom teacher, the students, and myself might be related to the "teacher change cycle" described by Pennington (1995).

Pennington describes three stages in the teacher change cycle:

Stage 1: Procedural

- involving techniques, materials, and logistics

Stage 2: Interpersonal

- involving the teacher's and the students reactions, feelings, roles and responsibilities, motivation, and classroom atmosphere

Stage 3: Conceptual

- involving personal meaning, explanation, integration of theory and practice

I believe that the classroom teacher, the students, and I moved through similar stages of change as a result of our experiences together in the content classroom.

Stage 1: Procedural

- techniques and materials: the classroom teacher, the students, and I used graphics to support content texts.
- logistics: the classroom teacher and I set aside time in and out of the timetable for collaboration, teaching, and planning.

Stage 2: Interpersonal

- reactions and feelings: the students, the classroom teacher, and I reflected upon our experiences within the content classroom.
- roles and responsibilities: the classroom teacher and I shared responsibility for planning, teaching, and meeting the needs of the ESL students within the class.
- classroom atmosphere: the students, the classroom teacher, and I were encouraged to interact thoughtfully and actively think about the meaning of graphics within the content class.

Stage 3: Conceptual

- personal meaning and explanation: through reflection the students, the classroom teacher, and I created meaning from our experiences.
- integration of theory and practice: from our experiences within the content class emerged a practical wisdom or theory about our learning and teaching.

Pennington's teacher change cycle is one way of conceptualising our process of change.

Summary: Re-visiting the Eight Themes

In this chapter I explored eight themes which emerged from the data and from my experiences and interactions within the content class. Exploring these themes was a part of the action research process, for it was through this written exploration that deeper understandings about teaching and learning came about. As I wrote and re-wrote, as I thought and re-thought, I searched and re-searched for personal meaning within the eight themes. This personal meaning was rooted in the context of the content class and from it developed a "theory of practice" (Schechter & Ramirez, 1992) as it related to the initial research question:

In what ways and to what extent do graphic representations of text/knowledge structures enhance ESL student academic learning within the context of a grade six science class?

A skeletal representation of this theory of practice is illustrated in Figure 4.4.

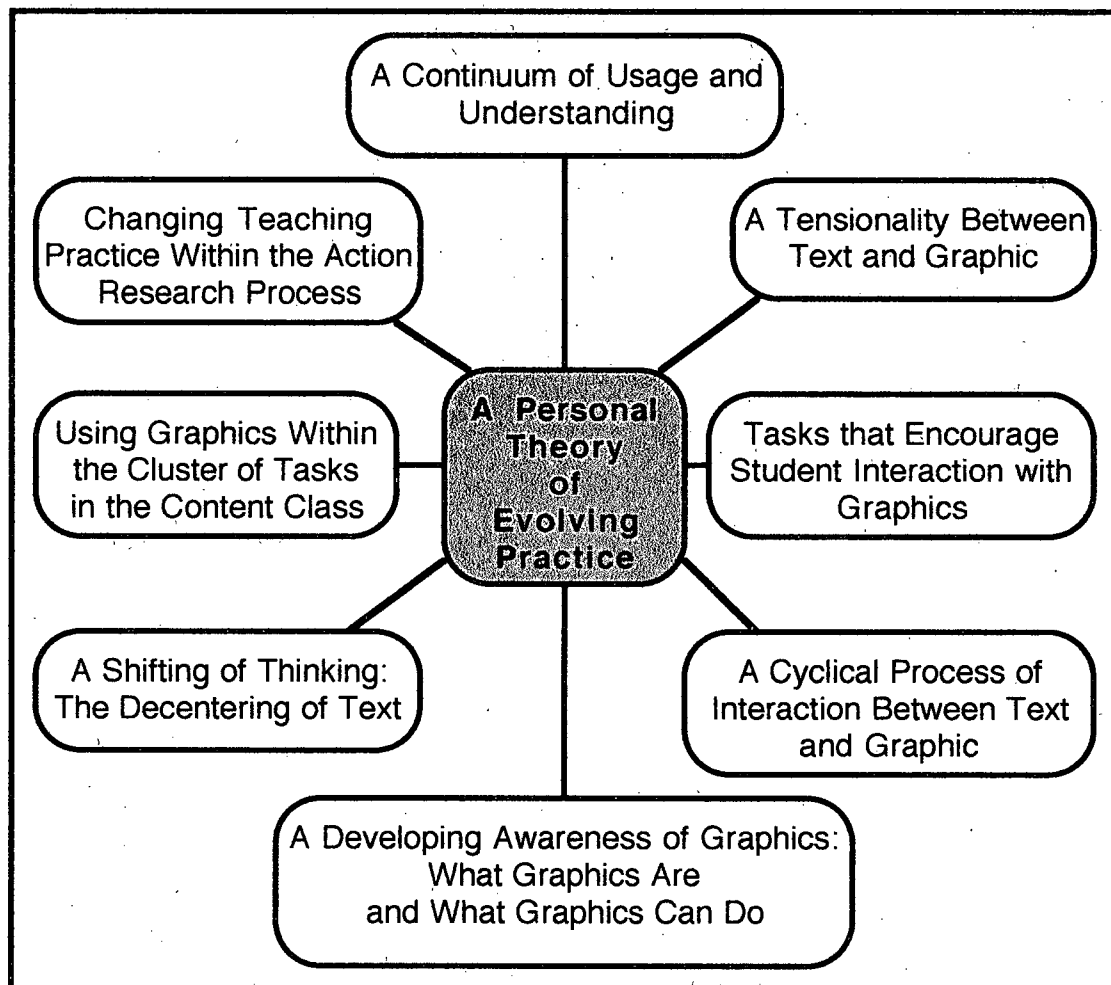


Figure 4.4
A Personal Theory of Evolving Practice

As stakeholders in the research process, the classroom teacher, the students, and I created this theory of practice within the *life* of the content class. In chapter five I will discuss and expand upon this theory of practice.

Chapter Five

Epilogue

From Within the Action Research Process Come Emergent Understandings

Introduction

I have organised this chapter into ten sections. In eight of these ten sections I have summarised a theme from my research and discussed the conclusions that I have drawn out of the theme. I have linked each theme to the practice of teachers, accepting that the themes are context specific and yet inform pedagogy through "possibilities for reunderstanding the meaning and significance of teaching" (Aoki, 1993, p. 1) Finally, I have presented the possibilities for new understandings, through future research, that have emerged from each theme. In the final two sections I discuss the richness of the collaborative experience and the tensionality between theory and practice.

A Personal Theory of Evolving Practice.

Out of the data that I gathered and the action research process emerged eight themes that I have woven together into a personal theory of evolving practice. This theory of practice emerged from within a specific teaching and learning context and has particular meaning for the students and teachers who dwelled in this context. I believe that this theory of practice was created, not by me alone, but by the all the participants in the research process. The participants, the students, the classroom teacher, and I, were all stakeholders in the process of teaching, learning, and meaning-making encircling the use of the Knowledge Framework and graphics in the content class.

We, as individuals with different perspectives and understandings, all took from this theory of practice different meanings and insights that affected our teaching and learning.

Theme One: A Continuum of Usage and Understanding

As I reflected upon the sum of my research and subsequently the theory of practice that emerged from the research, I was able to draw conclusions that have impacted my practical wisdom about teaching and learning. I have seen and experienced how different students use and understand graphics at different levels and in different ways. This difference in usage and understanding did not appear to correspond to the level of English language development of students. In fact, the ESL reception class students, who were at the lowest level of English language proficiency, appeared to use and understand graphics at a consistently higher level than most of the other students in the content class. I have concluded that this is because the ESL reception class students received direct instruction from the ESL class teacher in the use of graphics and the Knowledge Framework, and were given many opportunities to use graphics in different academic contexts within their own class.

Perhaps another explanation for this continuum of usage is the range of learning styles represented within the classroom. The students who were visual learners, students who learn better by seeing what they need to learn, might have been more able to utilise graphics in their learning, because graphics presented information to them in a visual format. Likewise, the students who were auditory learners, students who learn better by hearing what they need to learn, might have

found it difficult to utilise graphics when the classroom teacher and I did not present graphics to them with an oral description or discussion. Teachers might want to explore the effect of learning style on students' ability to utilise graphics within their learning.

Within their own classroom contexts, in the midst of using the Knowledge Framework and graphics, teachers may expect to find students at different levels of understanding of graphics and students utilising graphics in different ways. Teachers may also find that explicit teaching of the use of graphics and providing students with varied opportunities to use graphics may enhance students' understanding and use of graphics. Further exploration of this continuum of usage and understanding of graphics may help teachers, in their own teaching contexts, to see how students use graphics.

Theme Two: Tensionality Between Text and Graphic

A tensionality between student produced texts and student produced graphics appeared to exist within tasks that required students to produce both text and graphic responses. This tensionality reflected the extent to which students relied on graphic rather than text to represent their understanding of content. Students with lower levels of English language proficiency appeared to rely more heavily on graphics to communicate their understanding of content. Students with higher levels of English language proficiency appeared to use graphics to complement their writing. Perhaps the students with lower levels of English language proficiency realised that since they were required to produce graphics for assignments and that they received marks for their graphics, that graphics were a

valid way of representing their understanding of content. Further exploration and discussion with students about how they perceive this tensionality between graphic and text is needed.

When I shifted my thinking from the perspective of student to the perspective of teacher, I realised that part of what I was observing might be related to my needs as I marked the students' work. When students had difficulty expressing themselves in writing I relied more heavily on their graphics to determine whether they understood the content. The tensionality between graphic and text existed from my perspective as the teacher. Graphics were not only a means by which students expressed understanding but graphics were also a means by which I assessed individual student's understanding of content within the science class.

Students, within their own unique learning contexts, can use graphics to represent their understanding of content while they are learning to express themselves in writing. Indeed all students may use graphics as a means of representing their knowledge of content. Alternately, teachers, within their own unique teaching contexts, may in part, rely on student produced graphics to assess student understanding of content. Further exploration of this tensionality between text and graphic may lead to new understandings about whether or not students perceive the relationship between graphics and text in representing their understanding of content.

Theme Three: Designing Tasks to Encourage Student Interaction with Graphics

Similar to Tang's (1991) finding that students generally do not utilise graphics in

their content texts, I found that in order for students to use graphics to support their content learning, the classroom teacher and I needed to design tasks that would encourage student interaction with graphics. Task design became a particularly important aspect of using the Knowledge Framework and graphics within the content class. It would appear that teachers cannot assume that students will independently and automatically use the graphics presented to them in activities, text books, and other resource material. Rather, teachers need to design tasks that will encourage students to use graphics as sources of information. Beyond that, it would appear that teachers need to convey to students the value of graphics in supporting learning, not only through direct instruction, but through the teachers' own actions in relation to graphics. It was my experience that students need to *see and experience* teachers using and valuing graphics within the day to day activities of the classroom over the many months of the school year. Designing tasks that encourage students to interact with graphics is a part of this *seeing and experiencing* for students.

Teachers may want to explore this theme within their own teaching contexts, with different content and with different student populations. Teachers may want to see what this theme "looks like" within their own classrooms. They may want to go beyond reading about this theme, to exploring this theme for themselves, thereby personalising and taking ownership of this knowledge. Perhaps this theme needs to "be judged afresh in particular circumstances" that exist in other classrooms (Elliott, 1991, p.50).

Theme Four: A Cyclical Process of Interaction Between Text and Graphic

When students engaged in tasks that encouraged them to interact with graphics, a cyclical process of interaction between text and graphic emerged for students. It appeared that as students read through a text questions would often arise for them regarding vocabulary, concepts, or definitions. A student would then seek to answer these questions by referring to the graphic, asking a friend, or asking a teacher. If the student asked a friend or a teacher, the friend or the teacher would usually use the graphic to explain and clarify meaning. Once the student's question was answered, he/she would return to reading the text. This process of interaction between text and graphic might only occur once or might occur many times during a task, depending on the needs of the individual student. Students with lower levels of academic English may rely on graphics to a greater extent during content reading tasks. These students may move through this cyclical process many times, in order to clarify vocabulary and concepts. I conclude that this process illustrates how graphics serve as a means of clarifying students' understanding of content text, and as such appear to accommodate the different learning and language needs of students. Within this cyclical process, graphics became a learning strategy that the students used independently or cooperatively to enhance their understanding of text.

This theme emerged from one classroom, with one group of students, and two teachers. It would be interesting for teachers, in other teaching and learning contexts, to explore this process and to identify if and how this process exists for their students. Audiotaping students and asking them questions as they interact and negotiate meaning while they work with text and graphic, would lead to a

more detailed analysis of the type of language students use during this process. To be engaged in the type of observation of students and the type of dialogue with students that this exploration would require, might lead to other understandings about the Knowledge Framework, graphics, and how students learn.

Theme Five: A Developing Awareness of Graphics

Throughout the research process I observed a developing awareness of graphics on the part of the students within the content class. This developing awareness of graphics emerged from within a classroom environment which valued graphics.

The classroom teacher and I explained to the students why we were using graphics in our teaching. We explained to the students that we were using graphics to help them understand what they were reading and learning. The classroom teacher and I demonstrated to the students, through our teaching, that we valued graphics as a source of information, a way to clarify understanding, and a way to represent information and understanding. We also encouraged the students to take ownership of their developing awareness of graphics, by inviting them into the reflective process. Student reflection became an integrated part of the science class.

It would appear that the explicit teaching of how to use graphics was only one factor in the classroom environment that encouraged student awareness of graphics. Teachers need to demonstrate through their own actions within the classroom that they value graphics and utilise graphics within their teaching. Also, students need to be encouraged to reflect upon their own use and understanding of graphics, so that they may develop a meta-awareness of the role that graphics

might play in their learning. I conclude that this process of reflection is a key element in developing student awareness of graphics. If students are to understand the value of graphics in their learning, then this knowledge of graphics needs to exist for them in their own minds. As Wells (1992) states, this knowledge needs to be "constructed -- or reconstructed -- by each individual knower through a process of interpreting or making sense of new information in terms of what he or she already knows" (p. 94).

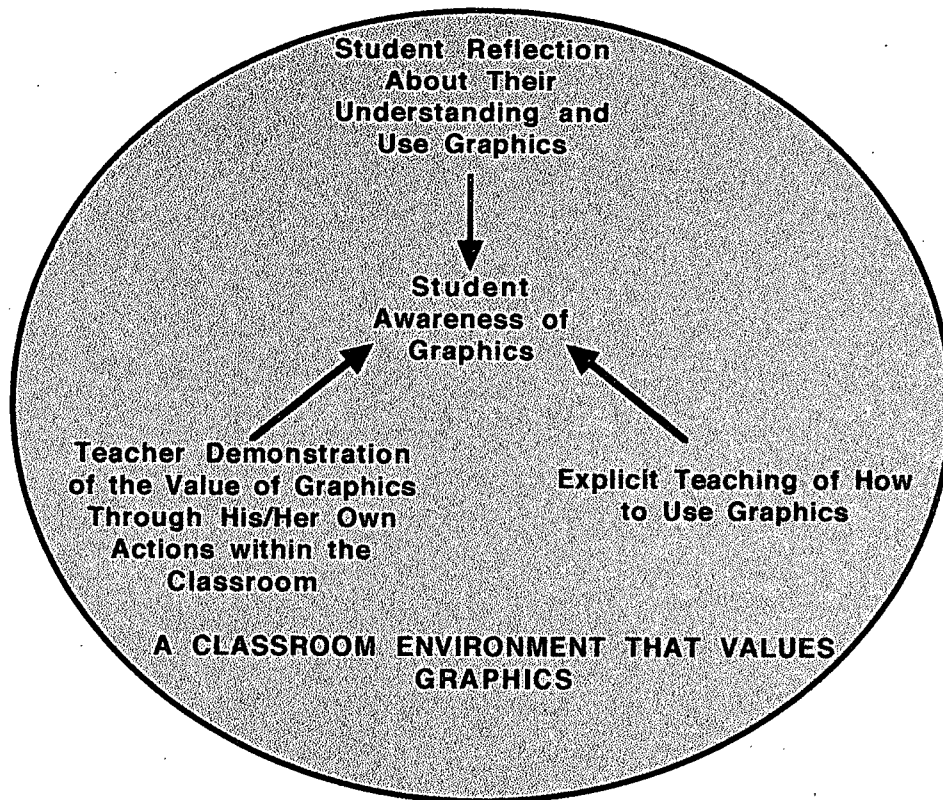


Figure 5.0
Factors that Influenced Student Awareness of Graphics
Within a Classroom Environment That Valued Graphics

Teachers, within their own individual teaching contexts, might reflect upon their own understanding of graphics and the way they use graphics within their classrooms. They might then consider how their understanding of graphics and their use of graphics impact their students' awareness of graphics.

Theme Six: A Shifting of Thinking ~~ The Decentering of Text

One aspect of the research process was the shifting of thinking which occurred for students, the classroom teacher, and for myself. Our shifting of thinking emerged from our experiences within the content class, and led to the decentering of text. Graphics did not become more important than text, but rather emerged to co-exist with text within the content classroom. With our growing awareness of graphics came our shifting of thinking about text, and eventually the decentering of text with graphics. Our attitudes towards graphics and text changed. The students began to understand the value of graphics in their learning. The classroom teacher understood graphics as visual aids that supported the students' learning of content. For the classroom teacher, graphics became an integral part of his teaching and the students' learning. For me, graphics became as important as text as a means for students to represent their understanding and knowledge in different academic tasks. This change in our attitudes occurred gradually, throughout the course of a school year and through many experiences with graphics.

Other teachers and students, within their own individual teaching and learning contexts, may experience a similar shifting of thinking about text. What individuals need to remember if they try to foster this change in the thinking of others, is that

this change appears to occur gradually over time and through many, on-going experiences with graphics. This issue of time leads to questions which teachers might wish to explore. Is one year within a classroom which values graphics sufficient to effect a permanent change in the thinking of students? Will students continue to use graphics in other learning situations which may not use graphics and the Knowledge Framework? Searching for understanding through the asking of these questions might lead teachers into their own "emergent curriculum of change" (Elliott, 1991, p. 17).

Theme Seven: Using Graphics Within the Cluster of Tasks Within the Content

Classroom

The classroom teacher and I used graphics within the cluster of tasks that we used in the content class. At the beginning of the flight unit, we started with the idea of using graphics to enhance student understanding of content texts. As the unit progressed our awareness of how graphics could be used expanded to all aspects of our teaching. We used graphics as an advance organiser to provide students with an overview of the flight unit. Graphics always accompanied the texts we presented to students. We used graphics to guide reading and note-taking. We used graphics as a review technique in open book quizzes. The classroom teacher and I relied on graphics to assess if students understood important flight concepts. At the end of the flight unit, we used graphics to evaluate the students' knowledge of content, as an aide to support the recall of content and the language structures related to specific content. Throughout the unit and the action research process, the role of graphics grew along with our awareness of the potential of graphics to enhance teaching and learning. From our experiences

within the content class, I believe that graphics did enhance the students' learning of science content. From my observations and experiences during the research process, I conclude that graphics can be used by teachers and students to enhance teaching, learning, and understanding in many of the tasks that occur in the content class.

Teachers, in their own individual teaching contexts, might want to explore how they use graphics to enhance student learning within the tasks that occur in their classrooms. As teachers' awareness and understanding of the Knowledge Framework and graphics expand and evolve, perhaps the use of graphics will permeate many of the tasks within their classrooms.

Theme Eight: Changing Teaching Practice

The concept of change is inherent in the action research process. Questions emerge from the teaching context, from the immediate needs of the teacher and students. Change occurred for the classroom teacher. Through our actions together in the classroom, the classroom teacher's level of awareness and understanding of the Knowledge Framework and graphics increased. These new understandings and this awareness emerged from thoughtful reflective practice and impacted the classroom teacher's teaching practice and practical wisdom about his teaching. After the formal research process was over, he sought to increase his understanding of the Knowledge Framework through professional development. The classroom teacher's practical wisdom continued to evolve almost two years after the formal research process. He continued to think about the Knowledge Framework and how it related to his teaching.

Change has occurred for me also. From within the research process I have developed a personal theory of evolving practice about the Knowledge Framework and graphics. This theory of practice has helped me to improve what I "do" within the classroom with students and teachers. As I interact with students and teachers, my understandings about the Knowledge Framework and graphics become a part of what we do together.

In this way, my understandings affect the understandings of other teachers and students. As I continue to use and explore the Knowledge Framework and graphics within my teaching, new possibilities for understandings will be created through my reflective practice. Although my theory of practice is personal and emerged from a particular teaching and learning context, I believe that teachers might draw meaning from it and recreate it for themselves through their own practice.

The Richness of the Collaborative Experience

The collaborative experience proved itself to be a rich experience, full of learning and insights into the content classroom (see Figure 5.1). By working together within the research process, we developed a better understanding of what using graphics and the Knowledge Framework "looks like" in a grade six science class. We saw how graphics could be utilised in many of the tasks in the content class. We saw that factors such as length of exposure and amount of experience with graphics appeared to have a greater impact on students' ability to utilise graphics, than reading level or academic English language development. The classroom teacher and I gained insight into how students interacted with graphics within

academic tasks. We realised that a change in our thinking took place over time and with many varied experiences with graphics. We saw that reflection was an integral part of the research process for both students and teachers, because reflection enabled both students and teachers to integrate what we were learning into our own developing knowledge of graphics.

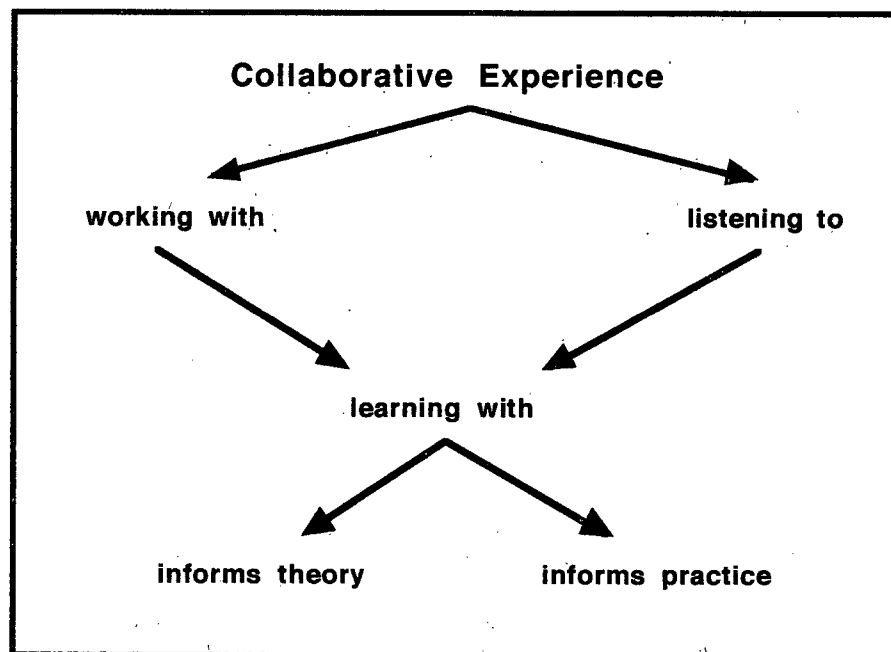


Figure 5.1
The Richness of the Collaborative Experience

On one level, collaboration existed between the classroom teacher and myself. We worked with each other, exploring the *and* between English language support teacher *and* classroom teacher. A sense of collegiality emerged between us, as we shared our knowledge, experiences, reflection, and understandings. What emerged between us reflects what Schlechty (1987) proposes, that "a shared

research experience can promote collegiality and experimentation as common processes are employed or common problems analysed publicly" (p.152). The classroom teacher and I worked together, using the Knowledge Framework and graphics, to meet the needs of the students within the science class. Our experience was similar to that of Tang (1994), in her study of teacher collaboration and the Knowledge Framework, in which she discovered that an ESL teacher and a computer teacher found "the Knowledge Framework a powerful tool for lesson planning and making instructional materials more meaningful for the students" (p.112). There was a *working with* and a *listening to* that enabled the classroom teacher and me to mutually benefit from the collaborative experience. This *working with* and *listening to* relates to one of the observations of Hurren's (1994) study of collaboration and ILC instruction, that the relationship that developed between the ESL specialist and the classroom teacher was "an essential component" of the success of the collaborative experience.

On another level collaboration existed between the students, the classroom teacher, and myself. By engaging in reflection, the students became active participants in the research process. Reflection was a mode of interaction for students, as they entered into a dialogue with themselves through their reflective writing (Wells, 1992). We worked with each other exploring the *and* between *student and teacher*. Through our interacting with each other during the varied tasks of the content class, the students began to develop their understanding of graphics and the Knowledge Framework. On a different level, the students, especially the ESL reception class students who had been in Canada for less than two years, became familiar with the practices, routines, and academic language functions of the English-speaking content classroom (Tang, 1993). I feel that

insights into the students' learning, use, and understanding of the Knowledge Framework emanated from listening to students. Listening to students needs to be an integral part of working with students, so that change, when it occurs, is relevant to students as well as teachers and researchers. The classroom teacher and I were not only teaching the students, but learning *with* the students in the content class. In Freeman's words this is part of the "process of evolving shared understandings of what to learn and how to learn" (p. 76, 1992). The *working with* students and *listening to* students led to a learning that informed theory and informed practice.

A Lingerin Thought About Theory and Practice and the Knowledge Framework.

A tensionality exists between theory and practice. While theory informs practice, practice informs theory. Teachers may begin with theory, such as the Knowledge Framework, but need to rediscover theory within their own practice. Theory is "validated through practice" (Elliott, 1991, p.69). This is necessary if teachers are to own theory as it relates to their own practice, thus creating a personal theory or practical wisdom. Teachers may begin with their practice and the questions which emerge from their practice. Through reflective teaching, these questions may lead teachers to seek out theory beyond their practice.

I have experienced this tensionality between theory and practice, as theory and practice became intermingled within the reflective space in which I dwelled. My purpose within my research process was to link the theory of the Knowledge Framework with the day to day practice of a content classroom, to link the curriculum-as-plan to the curriculum-as-lived. I believe my research and the themes that emerged from my research, demonstrate one possible context for and manifestation of the Knowledge Framework as it exists within the life of the content classroom. I believe that the themes within my research woven together to form a personal theory of evolving practice, express possibilities for enhancing ESL student academic learning within the context of a grade six science class.

The personal theory of evolving practice has guided my interactions with the students and teachers that I have gone on to work with in my roles as ESL Reception Class teacher and English Language Support Teacher. I have integrated student reflection into daily student tasks, discussion, quizzes, and unit end tests. I have a broader understanding of how graphics can be used in many of the tasks found in content classes. I am careful to structure tasks so that the tasks encourage students to interact with graphics. I talk with and listen to students as they reflect upon their learning and my teaching, so that I might improve my interactions with students. I am also more confident in my belief that the

Knowledge Framework and graphics enhance ESL student academic learning of content, because I have experienced and examined their positive impact through my research. The theory of the Knowledge Framework and the practice of the content class have begun to merge for me, in my context as a teacher researcher and a colleague of teachers.

Teachers and students within their own teaching and learning contexts may wish to explore these and other possibilities in ways which are personally meaningful. I hope that this research is able to "feed practical judgment in concrete situations, and [I believe] the validity of the 'theories' or hypotheses it generates depends not so much on 'scientific' tests of truth, as on their usefulness in helping people to act more intelligently and skilfully" (Elliott, 1991, p. 69).

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Appendix A
Participant Information

107

Participant	First Language	Country of Birth	Age and Year of Arrival	Languages Spoken at Home	Age of First English Instruction
1	Punjabi	Canada	N/A	Punjabi and English	4 or 5
2	Cantonese	Hong Kong	6 1988	Cantonese and English	5
3	Hindi	Fiji	8 1990	Hindi and English	6
4	Hindi	Canada	N/A	Hindi and English	5 or 6
5	Hindi	Canada	N/A	Hindi and English	6
6	Chinese	Canada	N/A	Chinese and English	5 or 6
7	Cantonese	Hong Kong	6 1988	Cantonese	8*
8	Chinese	Hong Kong	9 1988	Chinese	6
9	Vietnamese	Philippines	5 around 1987	Vietnamese	5 or 6

Participant	First Language	Country of Birth	Age and Year of Arrival	Languages Spoken at Home	Age of First English Instruction
10	Cantonese	Vietnam	9 1991	Cantonese and English	9
11	Chinese	Canada	N/A	Chinese and English	5 or 6
12	Hindi	Fiji	2 1984	Hindi and English	5
13	Cantonese	Hong Kong	10 1992	Cantonese	9
14	Cantonese	Hong Kong	8 1991	Cantonese and English	8
15	Cantonese	Hong Kong	9 1992	Cantonese and English	9
16	Punjabi	Canada	N/A	Punjabi and English	4 or 5
17	Chinese	Canada	N/A	Chinese	5 or 6
18	Cantonese	Canada	N/A	Cantonese English Mandarin	3
19	Portuguese	Canada	N/A	Portuguese	5

Appendix B
Student Reflection Sheet

PARACHUTES

QUIZ: 94-06-15

3. Describe how a parachute works.

4. Think about the work we have been doing about parachutes. What has helped you to understand the topic parachutes?

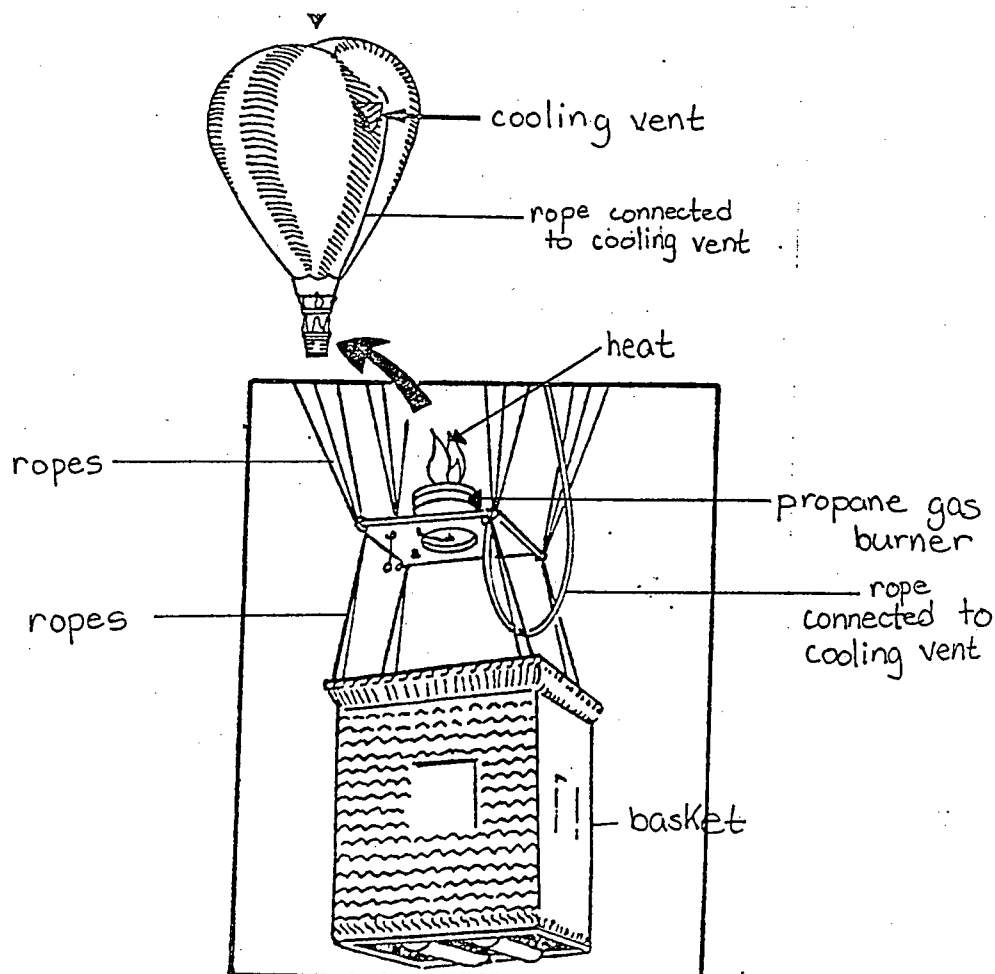
Appendix C Text and Graphic

HOT-AIR BALLOONS (1)

DESCRIPTION

*Read the following paragraph about a hot-air balloon. When you have finished reading, turn the paper over. Then turn to your partner and describe a hot-air balloon.

A hot-air balloon has many parts. Each of these parts serves an important function. Each of these parts helps the hot-air balloon to fly. A hot-air balloon has three sections. The first section is the **basket**. The basket carries the passengers and pilot. The second section contains the **propane gas burner** which produces the heat that helps the hot-air balloon fly. The third section is the **balloon**. This section holds the air that helps the hot-air balloon fly. This section also contains the **cooling vent**, which the pilot uses to make the hot-air balloon descend. A long **rope** running from the basket to the cooling vent allows the pilot to open and close the cooling vent. Many **ropes** are used to attach the basket, the propane gas burner, and the balloon.



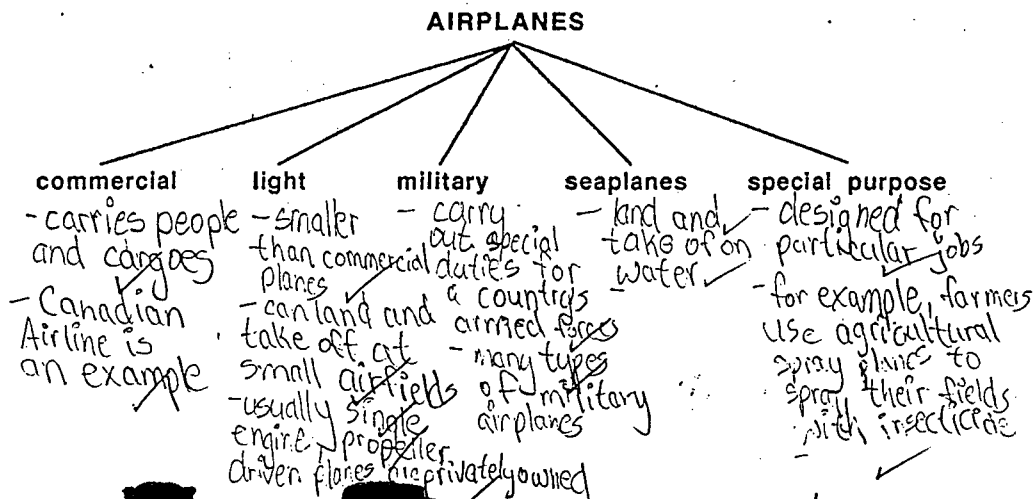
Appendix D

Task that Encouraged Student Interaction with Graphic

AIRPLANES

TYPES OF AIRPLANES

There are many types of airplanes. One type of airplane is **commercial transport planes**. These are large planes, owned by airline companies, that are used to transport people and cargo. Another type of airplane is **light planes**. These planes are smaller than commercial planes and can land and take off at small airfields. Light planes are usually single-engine, propeller-driven planes which are privately owned. A third type of airplane is **military planes**. These airplanes carry out special duties for a country's armed forces. There are many types of military airplanes. A fourth type of airplane is **seaplanes**. These airplanes can land and take off on water. The last type of airplane is **special purpose planes**. These planes are designed for particular jobs. For example, many farmers use agricultural spray planes to spray their fields with insecticide.



NAME: [REDACTED]

DATE: June 23/94

(13)

$$\frac{13}{14}$$

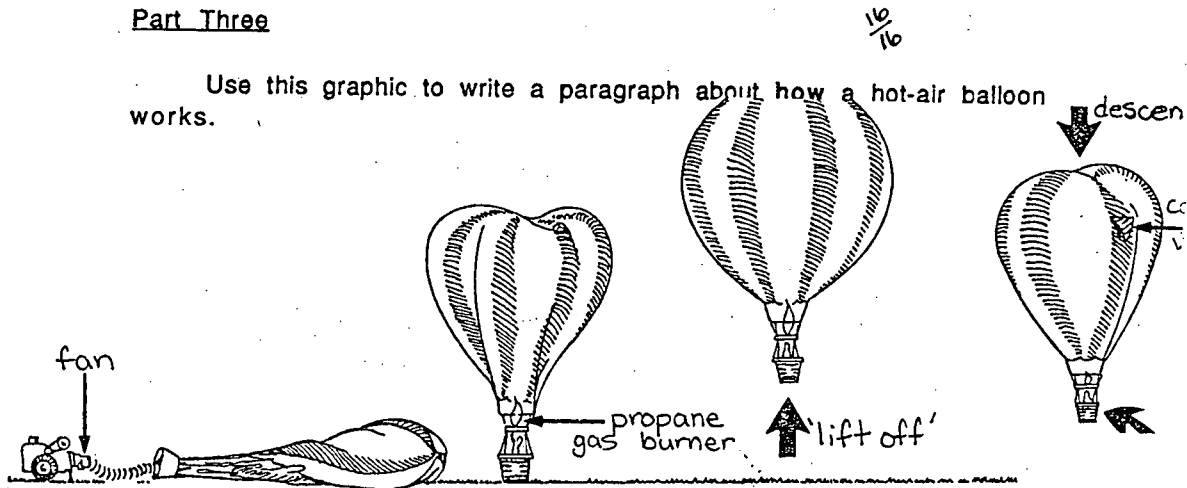
Appendix E

Marking Student Tasks

PAGE THREE FLIGHT TEST: 94-06-27

Part Three

Use this graphic to write a paragraph about how a hot-air balloon works.



When a balloons going to rise into the air (First) a fan has to blow some air into the mouth of the balloon to inflate it. (Next) a pilots going to light up the propane gas burner then the heated air inside the hot air balloons going to expand and fill it with heated air from the propane gas burner. (After) then the hot air balloons going to lift off the ground and rise up into the sky. (Once) it is up in the sky the thrust or forward push on the balloon will come from the wind. (Finally) if the pilot wanted the balloon to come down he or she will burn less fuel to make the hot air less hot, or if the pilot wanted the hot air balloon to come down faster he will open the cooling vent to let some hot air out and descend it.



•identifying and describing each step of the process
(content knowledge)



•sequence/time words



•verbs related to the content of how a hot-air balloon works

Appendix F

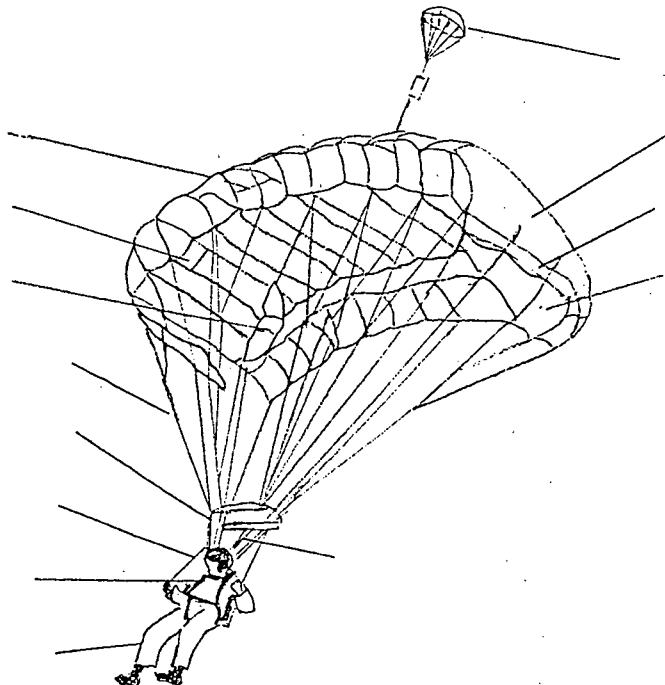
Parachute Graphic and Text

PARACHUTES

DESCRIPTION AND PRINCIPLES

A parachute is an umbrella-shaped or wing-shaped device. Its shape creates resistance in the air, which in turn, slows down the descent of the parachute and whatever it is carrying. This resistance allows the parachute and whatever it is carrying to fall to the ground safely.

A parachute has six basic parts. The first part is the **pilot chute**. This is a small canopy used to pull out the larger canopy. The second part is the **main canopy**. The main canopy is made of nylon and can vary in size from 6.7 to 9.8 meters in diameter. The third part is the **suspension lines** that run from the canopy to the harness. These lines attach the harness to the canopy. These lines can also be used for steering the parachute, so that the pilot or jumper can control where the parachute lands. The fourth part is the **harness**. The harness is a series of straps that fit around and support the pilot's body. The fifth part is the **ripcord**. When the ripcord is pulled it causes the canopy to open and inflate. The last part of a parachute is the **container or pack** which holds everything except the harness.



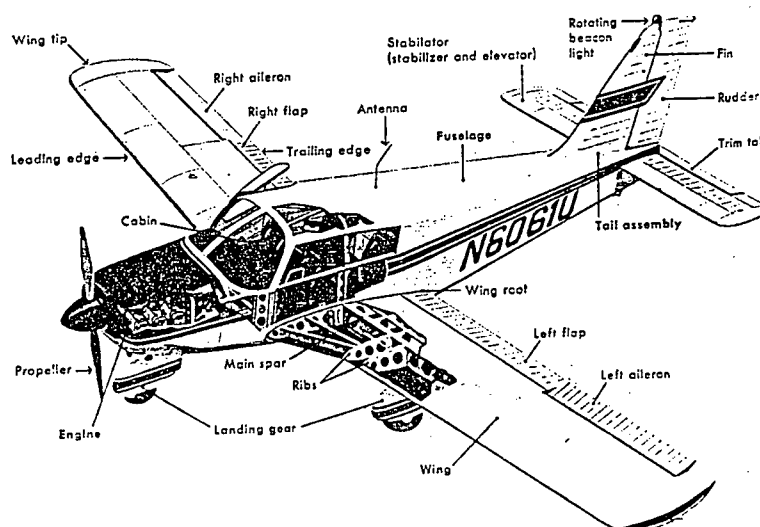
Appendix G

Parts of An Airplane Description and Function

PARTS OF AN AIRPLANE DESCRIPTION AND FUNCTION

Most airplanes have the same basic parts. These parts are the wing, the fuselage (body), the tail assembly, the landing gear, and the engine. The wing of an airplane extends outward from each side of the fuselage. A wing has a flat bottom and a curved top. The shape of the wing helps create the lift that raises an airplane off the ground and keeps it in the air. This shape is called an airfoil. The landing gear consists of the wheels or floats on which an airplane moves on the ground or water. The fuselage is the body of the plane. The fuselage contains the engine(s), the controls, the pilot, the passengers, and the cargo.

The tail assembly is the rear part of the airplane. It helps guide the plane and keep it balanced in flight. Most tail assemblies consist of a vertical fin and rudder and a horizontal stabilator (stabilizer and elevator). The fin keeps the rear of the plane from swinging to the left or right. The rudder helps control the plane during a turn. The stabilizer and elevator are part of the stabilator. The stabilator does two things. It keeps the plane flying in a steady horizontal direction and the pilot moves it up and down to raise or lower the plane's nose.



PARTS OF AN AIRPLANE

PART DESCRIPTION AND FUNCTION GRAPHIC/PICTURE

NAME:

DATE:






Appendix H

Student Work Samples Along the Continuum

PARACHUTES

CLASSIFYING INFORMATION ON PARTS

Using the information given on the previous page fill in the chart below. Provide description and it's function along with a simple illustration in the spaces provided.

part	description+function	drawing
pilot chute ✓	- a large canopy we pull out pilot canopy ✓	
main canopy ✓	- it is made for the pilot go down slowly	
lines ✓	- use for steering the parachute, so that the pilot can control where they land	
harness ✓	- a series of straps that fit around the pilot's body and holds it.	
Ripcord ✓	- when its pulled it causes the canopy to opened and inflate	
Container or pack ✓	- it holds everything except the harness	


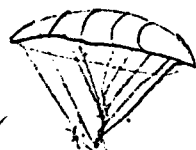



•The Lower End of the Continuum:
Student produced graphics with
no labels



PARACHUTES

CLASSIFYING INFORMATION ON PARTS

Using the information given on the previous page fill in the chart below. Provide description and it's function along with a simple illustration in the spaces provided.

part	description+function	drawing
pilot parachute ✓	- Small canopy holds the larger canopy to pull out ✓	 ✓
Main canopy ✓	- made of mesh - holds up more wind ✓	 ✓
suspension lines ✓	- connects to the harness to hold the main canopy ✓	 ✓
harness ✓	- Series of strips attach to the pilot ✓	 ✓
rip cord ✓	- when the rip cord is pulled the canopy opens ✓	
container pack ✓	- holds everything but not the harness ✓	 ✓


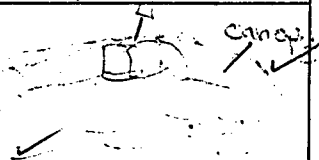
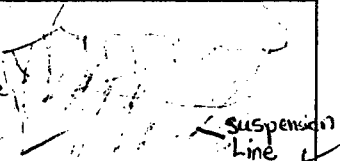

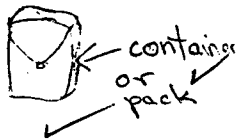
•Towards the Middle of the Continuum:
Student produced graphics with
Inconsistent use of labels (some graphics
are labelled, some graphics are not
labelled)



PARACHUTES

CLASSIFYING INFORMATION ON PARTS

Using the information given on the previous page fill in the chart below. Provide description and it's function along with a simple illustration in the spaces provided.

part	description+function	drawing
Pilot Chute ✓	- small canopy to pull out larger canopy. ✓	
Main Canopy ✓	- made of nylon - vary in size from 6.7 to 9.3 metres in diameter. ✓ - it helps you as you descend. ✓	
Suspension Line ✓	- run from canopy to harness - attach harness to canopy - lines for steering parachute so pilot or jumper can control where parachute lands ✓	
Harness ✓	- series of straps fit around and support pilot's body. ✓	
Ripcord ✓	- ripcord pulled canopy opens and inflates ✓	
Containers or Pack ✓	- holds everything except harness ✓	

•The Higher End of the Continuum:
Student produced graphics with each
graphic having at least one label

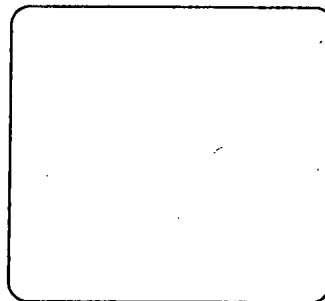
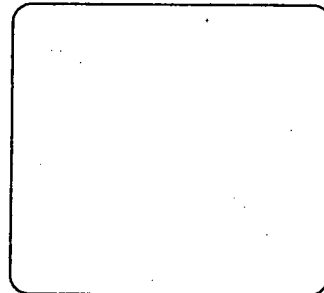
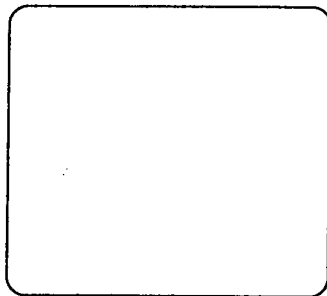


Appendix I
Designing Parachutes
Decentering Text

PARACHUTES

DESIGNING YOUR OWN

Use this page to design your own parachute. Please label your design (the parts of your parachute) and give reasons for the choices you make. You should create three different designs.



DESIGN 1

DESIGN 2

DESIGN 3

Appendix J
List of Student Responses

Student Responses that Indicated that Graphics had a Positive Effect on their Understanding of Content	Student Responses that Did Not Indicate that Graphics had a Positive Effect on their Understanding of Content
Well sometimes they have pictures on the bottom. If I don't understand I look at the pictures, or I ask my friend.	When I find more about it and find more information about the thing, and that makes it easier.
Uh sometimes there are some pictures. The teacher sometimes draw the picture and I understand that.	If I listen, then understand it better.
Sometimes draws a picture to show us why its like that.	No.
Label those parts. Like there's the chute that already has labels on it.	Uhm...no.
Examples help.	Find the dictionary. Sometimes we don't understand the paper has said the word. And when we find it make it easier to understand.

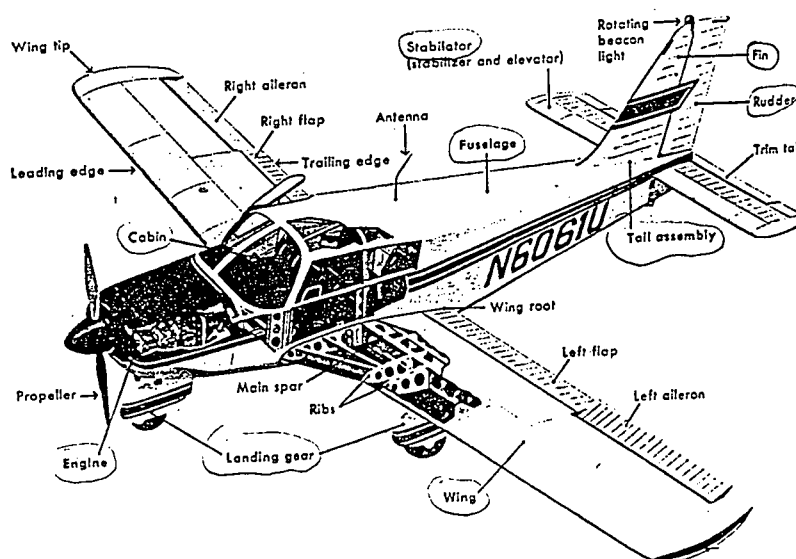
Appendix K

A Note-taking Task that is Generative/Explanatory/Evaluative

PARTS OF AN AIRPLANE DESCRIPTION AND FUNCTION

Most airplanes have the same basic parts. These parts are the wing, the fuselage (body), the tail assembly, the landing gear, and the engine. The wing of an airplane extends outward from each side of the fuselage. A wing has a flat bottom and a curved top. The shape of the wing helps create the lift that raises an airplane off the ground and keeps it in the air. This shape is called an airfoil. The landing gear consists of the wheels or floats on which an airplane moves on the ground or water. The fuselage is the body of the plane. The fuselage contains the engine(s), the controls, the pilot, the passengers, and the cargo.

The tail assembly is the rear part of the airplane. It helps guide the plane and keep it balanced in flight. Most tail assemblies consist of a vertical fin and rudder and a horizontal stabilator (stabilizer and elevator). The fin keeps the rear of the plane from swinging to the left or right. The rudder helps control the plane during a turn. The stabilizer and elevator are part of the stabilator. The stabilator does two things. It keeps the plane flying in a steady horizontal direction and the pilot moves it up and down to raise or lower the plane's nose.



PARTS OF AN AIRPLANE

PART	DESCRIPTION AND FUNCTION	GRAPHIC/PICTURE
landing gear	- consists of the wheels or floats on which air planes moves on the ground or water.	
fin	- keeps the rear of the plane from swinging to the left or right	
rudder	- helps control the plane during a turn	
stabilizer and elevator	- part of the stabilator - does two things - keeps the plane flying in a steady horizontal direction - helps the pilot move it up and down to raise or lower the plane	
tail assembly	- consist of a vertical fin, rudder and a horizontal stabilator - is the rear part of the air plane - helps guide the plane and keep it balance in flight	

NAME: [REDACTED]

DATE: June 23/94

(10)