

DOCUMENT RESUME

ED 453 690

FL 026 755

AUTHOR Jaipal, Kamini
TITLE English Second Language Students in a Grade 11 Biology Class: Relationships between Language and Learning.
PUB DATE 2001-04-08
NOTE 14p.; Paper presented at the Annual Meeting of the American Educational Research Association (Seattle, WA, April 10-14, 2001).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Biology; *English for Science and Technology; *English (Second Language); Foreign Countries; Grade 11; High School Students; High Schools; Second Language Instruction; Second Language Learning; Teacher Role; Teaching Methods
IDENTIFIERS British Columbia (Vancouver); Content Area Teaching

ABSTRACT

For English-as-a-Second-Language (ESL) students learning academic content is complex. The purpose of this study is to explore and gain an understanding of ESL students' participation and learning in grade 11 biology classes in a secondary school in Vancouver, British Columbia. The paper reports on one aspect of the study--the mediational role of language in learning biology terms and concepts. The main question guiding this aspect of the study was: what are the relationships between language and the ESL students' learning of biology terms and concepts? This question was explored by focusing on the following: teaching, how the teacher explains terms and concepts; and learning, how students' interpret terms and concepts in the teacher's oral explanations and written questions. The significance of this study lies in the provision of insights into particular language and content-related issues associated with both the learning and teaching of science in a mainstream secondary science classroom. Results suggest the following: (1) talking about language is integral to biology teaching and learning; (2) teaching involves more than showing and describing concepts in isolation; (3) English words in science worksheets often elicit functional explanations that support the construction of discourses of reasoning; and (4) new labels in second language may refer to a different set of features associated with the concept. (Contains 34 references, 4 figures, and 1 table.) (KFT)

ED 453 690

ENGLISH SECOND LANGUAGE STUDENTS IN A GRADE 11 BIOLOGY CLASS: RELATIONSHIPS BETWEEN LANGUAGE AND LEARNING

Introduction

In a study on the status of ESL in British Columbia schools, Naylor (1994) reports that teachers are unsure about how to teach ESL students in mainstream classes. Krugly-Smolka (1995) also reports that the teachers in her study "seemed ill-equipped to deal with students experiencing language difficulties in their classrooms" (p. 54).

For ESL students, learning academic content is complex. ESL students need to learn the English language and to use that language for learning. Their success as learners depends both on the acquisition of English language skills and academic content (Mohan, 1986). There is strong evidence that ESL students need from 4 to 6 years to acquire the level of English language proficiency required to participate fully in classroom settings (Cummins, 1981; Wong-Fillmore, 1986). These research findings suggest that there is a need to examine ESL students' learning in mainstream academic classes in an effort to provide support for both ESL students and teachers.

Purpose

The purpose of this study was to explore and gain an understanding of ESL students' participation and learning in a grade 11 biology classes in a secondary school in Vancouver. This paper reports on one aspect of the study - the mediational role of language in learning biology terms and concepts. The main question guiding this aspect of the study was: What are the relationships between language and ESL students' learning of biology terms and concepts? This question was explored by focussing on:

- a) Teaching: how the teacher explains terms and concepts.
- b) Learning: how students interpret terms and concepts in the teacher's oral explanations and written questions.

Educational Significance

The significance of this study lies in the provision of insights into particular language and content-related issues associated with both the learning and teaching of science in a mainstream secondary science classroom. Firstly, the present study extends the focus of the science education literature on students' learning in science to include particular groups—i.e., ESL students. In particular, this study enhances our understanding of the role of language in ESL students' learning of science concepts. Secondly, this study provides insights into the nature of scientific discourse during oral and written teaching tasks. Overall, the findings of this study support other attempts at enhancing the learning and teaching of both language and content in academic content courses (Early, 1990, Kessler, Quinn & Fathman, 1992, Roessingh, 1998).

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL HAS
BEEN GRANTED BY

Kamini Jaipal

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

This document has been reproduced as
received from the person or organization
originating it.

Minor changes have been made to
improve reproduction quality.

Points of view or opinions stated in this
document do not necessarily represent
official OERI position or policy.

67026735

Studies on Language and Science

Lemke (1990) explored how language is used in secondary schools to communicate and construct meanings in science. A significant finding of his study is that learning science involves learning how to successfully talk science. A limitation of Lemke's study is that it does not address how students with limited English language proficiency (LEP) may be helped to successfully learn to talk science.

A few studies have attempted to redress this limitation. Lee & Fradd (1996) examined the oral, written and pictorial representations that elementary students used in describing, interpreting, and summarizing science activities. Students from three diverse language backgrounds participated in the study. Their findings highlight the specific difficulties that students experience in developing and expressing their understandings. For example, LEP students had difficulties communicating science in written form. Lee & Fradd (1996) recommend that students be provided with concrete experiences connected with written and pictorial representations to facilitate students' comprehension and expression of science content.

Duran, Dugan & Weffer (1998) describe LEP learners in terms of the cognitive and linguistic tools they employed during science instruction. Participants were a homogeneous group of students whose first language was Spanish. The study examined the way in which 14 grade-10 biology students constructed an understanding of concepts as a result of instructional activity that engaged them in the practice of talking and writing science. A significant finding of this study was that LEP students' required detailed, explicit instruction about how to put biology content into language. To this effect, diagrams and visual representations played a critical role in establishing a shared context for constructing meaning.

The present study builds upon and extends the work of the preceding studies by exploring:

1. the ways in which the oral and written language used by the teacher mediated ESL students' learning of biology terms and concepts,
2. the role of peers in mediating ESL students' learning, and
3. the ways in which ESL students' prior knowledge of concepts mediated concept learning.

Theoretical Framework

Sociocultural Theories of Learning

This study is situated within a social-constructivist framework and specifically draws upon the works of Vygotsky (1962, 1978, 1987) and Wertsch (1991, 1998). According to Vygotsky (1978), a distinguishing characteristic of higher mental processes is that psychological tools mediate it. Unlike material tools that are externally oriented and

mediate between human hand and object of action, psychological tools are internally oriented and transform mental functions. Psychological tools such as signs and sign systems (e.g., language, mnemonic techniques, diagrams, maps, writing, and drawings) mediate the learning of concepts.

Wertsch (1998) argues that all human action, whether it involves an individual acting alone or engaging in social interactions, is mediated action. In his work, Vygotsky emphasized two kinds of mediational means: signs and sign systems (especially the use of language) and interpersonal relations (Daniels, 1996). The latter type of mediation can also be described as mediation through another person (Kozulin, 1990). In addition, learning concepts is also mediated by the prior knowledge and experiences of the learner (Dewey, 1938, Vygotsky, 1987). In this regard, Dewey (1938) maintains that what is learned in one situation provides the starting point for further learning. A fundamental assumption underlying this paper is that three types of mediational means mediate students' learning in classrooms: sign systems (particularly language), interpersonal relations such as teacher-student social interactions and the learners' prior knowledge and experiences.

Learners use mediational means during social interactions to make sense of the actions or activities that surround them. External sign mediators such as diagrams or language first serve a social or communicative function before becoming an internal psychological process. Individuals therefore first make sense of talk and activity at the social or interpersonal level and then at the individual or intrapersonal level (Vygotsky, 1978). Daniels (1996, p. 10) points out that, "The social does not become individual by a process of simple transmission. Individuals construct their own sense from socially available meanings." The learner thus uses existing or prior knowledge and experiences to interpret new knowledge and experiences (Ausubel, 1963). Learners therefore reconstruct the talk and activities of the social plane (Scott, 1998). Hence, a second assumption underlying this paper is that learning involves both a social and a personal construction of meaning.

Theories about Second Language Learning

A commonly held view of second language learning is that learning a word in a second language is mediated by one's knowledge of the meaning of the word in the first language (Vygotsky, 1986). According to Vygotsky (1986), when a child learns a second language the child "uses the semantics of the native language as its foundation" (p. 160). That is the child uses his or her prior knowledge of the meanings of words in the first language to learn the meanings of words in the second language. In this way, the native or first language is used "as a mediator between the world of objects and the new language" (p. 161). Vygotsky (1986) elaborates further that, "we use word meanings that are already well developed in the native language, and only translate them" (p. 157).

Research findings in second language learning support the idea that meanings underlying words in the first language mediate second language learning by meanings being transferred to the second language (McGroarty, 1992). In these instances, the child "has only to acquire a new *label* in [the second language] for an already existing concept"

(Cummins, 1992, p. 22). The assumption, that students are learning a new label for an available word or concept in their first language, has been questioned (Allen, 1991). As the findings of this study show, translation of words from the first language into the second language does not necessarily convey the conceptual meanings underlying the new word.

Theories about Language

Halliday (1998) contends that language or grammar transforms human experience into meaning. Grammar imposes categories on our perceptions of phenomena—that is it sets up a theory of experience, modeling the complex interaction between the human organism and the environment. This modeling has for the most part been interpreted as “a largely passive process of correspondence” where the term or concept “simply reflects, or codifies something that is out there” (Halliday, 1998, p. 187). This modeling view of language is reflected in traditional notions of teaching where new terms and concepts are taught by showing and/ describing the thing or object. Halliday (1998) argues that language or grammar does not merely reflect things or objects. There are many ways that the phenomena of our experience relate to one another and grammar imposes a categorization so that similar terms and concepts are grouped together. Grammar therefore construes phenomena into classes and taxonomies (classes of classes) so that teaching and learning a term or concept involves contrasting the term with other terms within classes and taxonomies.

While Halliday’s view of language applies to both everyday and scientific language, terms and concepts expressed in everyday life are easier to comprehend because of the structure of the language. Our everyday experiences are construed around the category of “process”—that is in the form of a grammatical unit, a clause consisting of a nominal group (noun), verbal group (verb), adjectives, adverbs or prepositions and conjunctions (Halliday, 1998). In the following example (an everyday experience), two clauses are related by the conjunction “so.”

“The girl swam very fast across the pool	so	she was tired.”
Clause	relator	clause

Students construct everyday experiences using the above form of grammatical pattern and reasoning.

Scientific language, on the other hand, is often characterised by an elaborated grammatical pattern that consists of nominal groups connected by a verbal group (Halliday, 1998). A ‘group’ is an expanded word (in this case around a noun). A biology text example is:

Rapid changes in the rate of evolution	are caused by	external events.
Nominal group	relator/verbal group	nominal group

The example of the girl swimming will be used to illustrate how this elaborated grammatical pattern is constructed.

Everyday Language:	The girl swam very fast	so	she was tired.
	Clause	conjunction	clause
Scientific Language:			
	The fast swim of the girl across the pool	resulted in	tiredness.
	Nominal group	verbal group	nominal group

During the above grammatical transformation (characteristic of scientific language)- a process (first clause) and/ a quality (second clause) are transformed into nominal groups and reworded as a single clause. Hence, during science instruction, both ESL and non-ESL students encounter scientific language written or expressed in this elaborated grammatical style, a form of discourse unfamiliar to them.

Scientific language has also evolved as a result of mainly nominalization-that is turning verbs and adjectives into nouns (Halliday, 1998). Halliday uses the following example to illustrate the process of nominalization. A process such as "move" is observed, generalized, and then theorized about. In this way, the process becomes a virtual entity "motion". The process "move" is now transformed into a noun functioning as thing. The word "motion", a noun, now has the potential to be expanded into a taxonomy (e.g., linear motion, orbital motion, periodic motion) and functions as a theoretical abstraction within a taxonomic structure. The register of science is characterized by such technical taxonomies of virtual objects. An important implication of this type of language structure is that teaching terms and concepts in science involves more than showing and describing; it involves comparing and contrasting virtual objects within taxonomies.

Scientific language is also characterized by discourses of reasoning such as drawing conclusions from observations, thesis-evidence-conclusion, compare/contrast, cause/effect, and problem/solution where language is used for the functions of hypothesizing, predicting, explaining, inferring, generalizing, classifying, and problem-solving (, Halliday, 1998; Lemke, 1990; Sutton, 1992).

The differences in grammatical and reasoning patterns between everyday language and scientific language often act as barriers in students' construction of meanings. It is often the case that the specialized vocabulary and grammar necessary for talking and writing in science may not be part of most students' everyday experiences. This suggests that greater intervention and guidance may be necessary in the case of ESL students, most of who are still in the process of learning English grammar and figures of speech. As Halliday (1998, p. 223) points out, "Children first construe experience in the clausal form, in the grammar of daily life. For them the nominalizing grammar of scientific discourse demands a massive act of reconstruction, one of the major barriers to the technical, discipline-based knowledge of secondary education."

In this paper, the above theories of learning and language will be used to analyse data and support findings.

Method

Data were collected primarily using participant observation and interviewing techniques (Atkinson & Hammersley, 1994). Fifty seventy-minute lessons were observed over the eight-month period. In addition, I accompanied students on three field trips. Participants' social interactions in the classroom and field trips were recorded in copious field notes. Forty classroom lessons including selected small group activities were audio recorded and eight lessons were video-recorded. Two semi-structured interviews, one at the beginning of the project and one at the end of the project, were used to elicit students' backgrounds, views about learning, language, science and their experiences as research participants. As well, participants filled out a short questionnaire about their personal and prior school experiences at the beginning of the project. In addition, a number of short interviews were conducted with individual and groups of students during the course of the year. These short interviews focussed on students' specific experiences and /or difficulties in understanding concepts during lessons. Students written assignments, laboratory write-ups and tests were also collected to assist in the triangulation of data.

Analysis

The analysis of data is consistent with a sociocultural approach to development. Rogoff, Radziszewska and Masiello(1995) maintain that individual, social and cultural analyses are inseparable. They contend that the aim of this approach "is to understand the developmental processes involved in activities, at the level of individual, interpersonal, and community (or cultural) processes" (Rogoff et al., p. 129). Furthermore, they suggest that any of these planes of observation can be the focus of analysis with the other planes acting as the background. This sociocultural approach is applied to the analysis of ESL students' learning in the present study. Data were analyzed by focusing on the contributions of individual students as they interacted with the teacher and other students during whole class and small group interactions. The analysis was conducted within the larger context of the community (For example: how did family or cultural expectations influence students' interactions in class?-N.B. not addressed in this paper)

The diagram below illustrates how the three planes of observation are woven together into the fabric of the analyses.

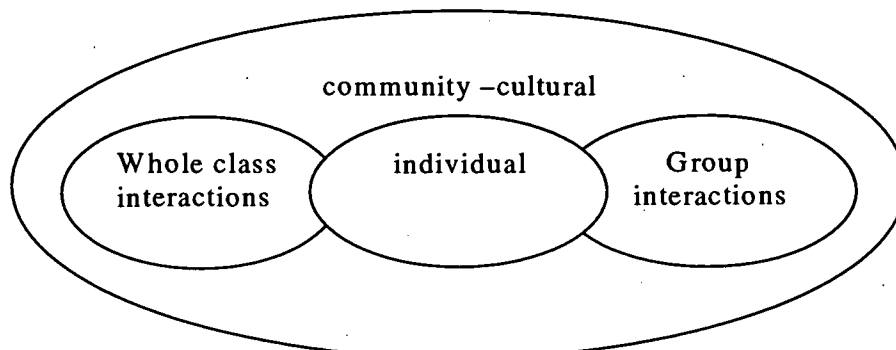


Figure 1: Interconnecting planes of observation

All interviews with individual and groups of students were transcribed verbatim. Transcripts of interviews and field notes were coded in terms of categories taken from the interview protocol and on emergent categories from the transcripts. Examples of coding categories were biography-language (bio-lang), biography-prior schooling (bio-school), learning, science concepts, participation, group work, teaching strategies, language difficulties. Field notes also described the events and activities recorded on audio and videotapes. As field notes were coded, selected excerpts of audio and video recordings were transcribed verbatim. Background questionnaires, note on informal discussions with the teacher and students' written work were used to supplement information and triangulate data.

The analysis of results took place at two levels:

- 1) a general level focussing on the mediational role of the three psychological tools in ESL students' learning
- 2) a more specific level focusing on the role of the structure of scientific language on ESL students' learning.

Some illustrative examples are presented in the next section.

Results and Analysis

Teacher Mediation

Teaching concepts within taxonomies

Context: During a whole class lesson, the teacher explains the concept "bilateral symmetry"

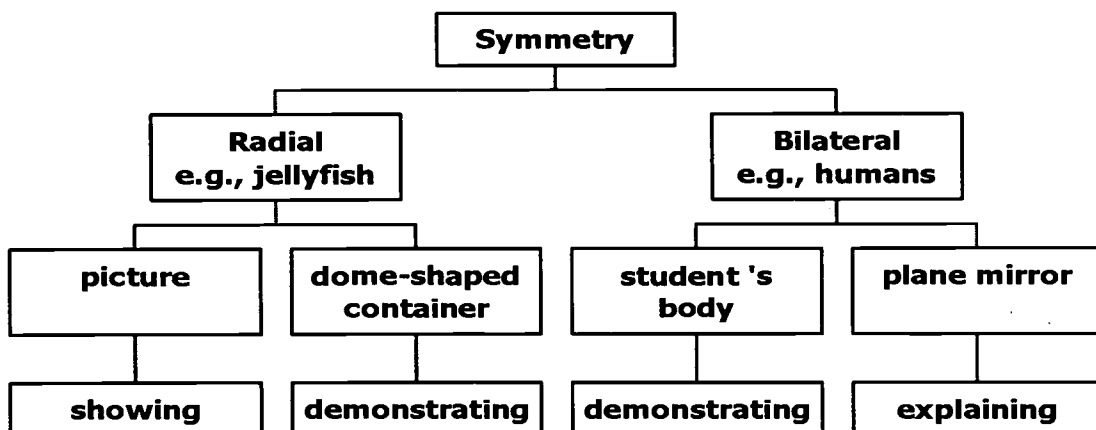


Figure 2: Teacher explanation of "Bilateral"

In this example, the teacher explains the meaning of a concept by contrasting bilateral and radial within a taxonomy. This example illustrates that teaching words and concepts involves more than simply showing and telling. It involves showing the relationships between terms and concepts within taxonomies.

This example also illustrates the variety of mediational means the teacher used to support ESL students in their learning of both language and science. The teacher

1. supplemented verbal explanations with visual aids to engage students in science learning
2. situated learning in contexts that were accessible to students through multiple teaching representations (e.g., visual demonstrations, everyday examples)

Nominalization of Terms

Context: During the section on structure-function relationships, the teacher introduces the concept “adaptation” to students and compares it to adapt. He compares the terms adapt and adaptation at two levels-their grammatical function and their meanings.

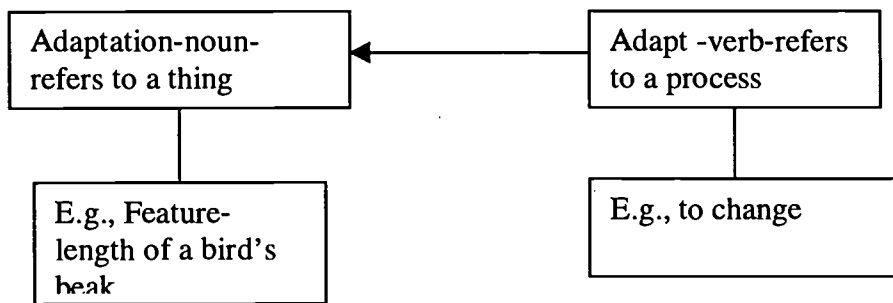


Figure 3: Nominalization-turning a verb into a noun

In this example, a scientific concept was formed by a verb changing into a noun (nominalization). “Adaptation” is now functioning as an entity that exists as part of a theory on Living Things. The teacher is making students aware of how scientific language is created. At the same time, he is talking about language and contrasting the terms within a grammatical and a semantic taxonomy.

The Mediation Role of Prior Knowledge

Concept transfer from L1 to L2

Context: A Spanish-speaking student explained how she had difficulty relating the meaning of the term 'earlobe' to the shape of a leaf during a lesson on Plants.

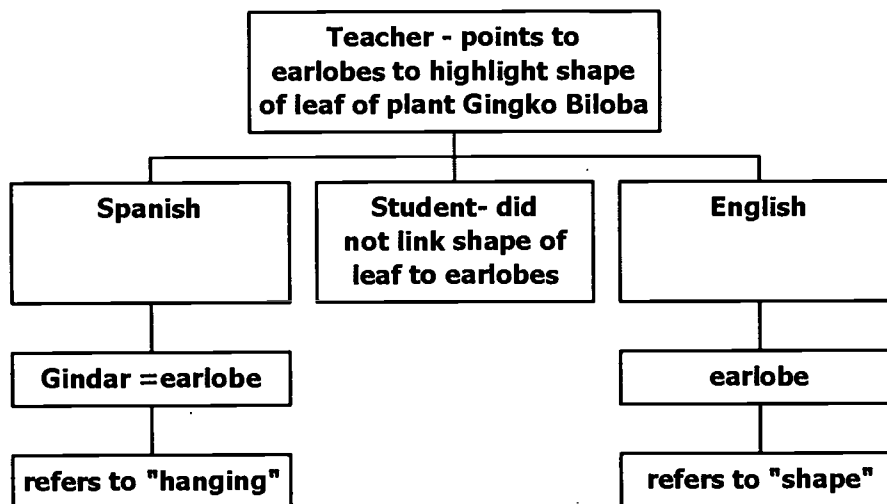


Figure 4: Concept transfer

In this example there is partial overlap of meaning. The concept in L1 (Spanish) and L2 (English) refer to the same thing (earlobe) but emphasize different features. This example highlights the notion that translation of words from the first language into the second language does not necessarily convey the conceptual meanings underlying the new word.

Peer Mediation

Interpreting Worksheet Questions

Context: During group work, an ESL student asked for the meaning of "essential" in the worksheet question "Why is water essential to all Sponges?" Another student explained the meaning as "necessary."

Interpretation 1

Peer mediation supports both language and science learning.

Interpretation 2

It is interesting to note that the student responded with the term "necessary." The word "essential" and "necessary" are terms that elicit functional explanations related to

conditions of life. These terms become conceptually central to constructing discourses of reasoning in biology.

Table 1: Summary of Findings

Traditional Views	Results Show
Talking about language is not a part of biology teaching.	Talking about language is integral to biology teaching and learning. Scientific language is characterized by verbs and adjectives that are nominalized.
Words are labels for things-teach meanings of concepts by showing and/or describing.	Teaching involves more than showing and/describing concepts in isolation - includes contrasting and learning in relation to taxonomies
If the learner knows the general meaning of English words, then she/he should be able to interpret written questions.	English words in science worksheets often elicit functional explanations that support the construction of discourses of reasoning.
If a learner knows a concept in her/his first language (L1), then learning the concept in the second language (L2) is merely a matter of learning new "labels" (Cummins, 1992)	New labels in L2 may refer to a different set of features associated with the concept.

Issues Raised by findings

Should science teaching include language teaching?

Is knowledge of a concept in the first language simply transferred to the second language?

How does teacher discourse mediate science learning - supporting the learning of individual words and concepts or constructing a discourse of reasoning?

Discussion

While evidence shows that the teacher and peers mediated ESL students' learning of science concepts, the findings of this study illuminate the subtle and complex relationships between language and learning during biology teaching and learning. The findings of this study contribute to and support the findings of Lee & Fradd (1996) and Duran et. al. (1998) about using visual graphics and demonstrations to enhance science learning among ESL students. This study also extends these findings by highlighting other ways in which language may be used to enhance both language and science learning. More importantly, this study reveals the significant role of language/grammar in constructing scientific language and discourses of reasoning.

The findings of this study reveal that the teacher:

1. discussed grammatical ideas such as nominalization of verbs, and the meaning and morphology of words.
2. contrasted concepts, terms and examples within scientific taxonomies
3. used non-scientific words (in worksheets) that elicited structure-function relationships and specific ways of reasoning in biology.

These findings challenge:

1. the notion that the job of the science teacher is to teach science and not language aspects.
2. traditional notions of language teaching where words are taught by showing and/or explaining the meanings.

The findings of this study also show that ESL students':

1. prior knowledge of concepts in the first language (L1) was not directly transferred to the second language (L2).
2. general knowledge of English words did not assist them in interpreting biology worksheet questions.

These findings challenge the notion that:

1. the child "has only to acquire a new *label* in [the second language] for an already existing concept" (Cummins, 1992, p. 22).
2. if students' have a general knowledge of words and concepts, they should not have difficulty interpreting these words in written questions.

The assumption that ESL students already understand what a concept means because they have learned the concept in their first language cannot be taken for granted.

REFERENCES

- Atkinson, P. and Hammersley, M. (1994). Ethnography and participant observation. In N. K. Denzin & Y.S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 248-261), Thousand Oaks, CA: Sage Publications.
- Ausubel, D.P. (1963). *The psychology of meaningful verbal learning*. New York: Grune & Sutton.
- Cazden, C.B. (1992). Classroom discourse: The language of teaching and learning. In D. Nunan (Ed.), *Collaborative language learning and teaching*. Cambridge, New York: Cambridge University Press.
- Collier, V. P. (1987). Age and rate of acquisition of second language for academic purposes. *TESOL Quarterly*, 21(4), 617-641.

Cummins, J. (1991). Conversational and academic language proficiency in bilingual contexts. *Alla Review*, 8, 75-89.

Cummins, J. (1992). Language proficiency, bilingualism, and academic achievement. In P.A. Richard-Amato & M.A. Snow (Eds.), *The multicultural classroom: Readings for content-area teachers* (pp. 39-57). White Plains, N.Y.: Longman Publishing.

Daniels, H. (1996). Introduction: Psychology in a social world. In H. Daniels (Ed.), *An introduction to vygotsky* (pp.1-27). Fetter Lane, London: Routledge.

Dewey, J. (1938). *Experience and education*. New York: Collier-Macmillan.

Duran, B.J., Dugan, T. and Weffer, R. (1998), Language minority students in high school: the role of language in learning biology concepts. *Science Education*, 82, 311-341.

Early, M. (1990). Enabling first and second language learners in the classroom. *Language Arts*, 67, 567-575.

Fathman, A.K. and Kessler C. (1993). Cooperative learning in school contexts. *Annual Review of Applied Linguistics*, 13, 127-140.

Halliday, M.A.K. (1998). Things and relations: Regrammaticing experience as technical knowledge. In J.R.Martin & Robert Veel (Eds.), *Reading Science: critical and functional perspectives on discourses in science* (pp. 185-235). Fetter Lane, London: Routledge.

Hammersley, M., & Atkinson, P. (1983). *Ethnography: Principles in practice*. London, Routledge.

Kessler, C., Quinn, M.E., & Fathman, A.K. (1992). Science and cooperative learning for LEP students. In C. Kessler (Ed.), *Cooperative language learning: a teacher's resource book*. Englewood Cliffs, New Jersey: Prentice-Hall.

Kozulin, A. (1990). *Vygotsky's psychology: a biography of ideas*. Hertfordshire, London: HarvesterWheatsheaf.

Kozulin, A. (1996). The concept of activity in soviet psychology: vygotsky, his disciples and critics. In H. Daniels (Ed.), *An introduction to vygotsky* (pp.99-122). Fetter Lane, London: Routledge.

Krugly-Smolka, E. (1995). Cultural influences in science education. *International Journal of Science Education*, 17(1), 45-58.

Lee, O. and Fradd, S.H. (1996). Literacy skills in science learning among linguistically diverse students. *Science Education*, 80(6), 651-671.

Lemke, J. L. (1990). *Talking science: Language, learning and values*. Norwood, NY: Ablex.

Mohan, B. (1986). *Language and content*. Reading, MA: Addison-Wesley.

Mcgroarty, M. (1992). Cooperative Learning: the benefits for content-area teaching. In P.A. Richard-Amato, & M.A. Snow (Eds.), *The multicultural classroom* (pp. 58-69). White Plains, NY: Longman.

Naylor, C. (1994). *What is adequate ESL/ESD support? The views of ESL teachers*. Vancouver: British Columbia Teachers' Association.

Roessingh, H. (1996). ESL students and the inclusive high school science class: an investigation into the effects of curriculum restructuring. Dissertation Abstracts ISBN 0-612-18643-1.

Rogoff, B (1993). Childrens' guided participation and participatory appropriation in sociocultural activity. In R.H. Wozniak & K.W. Fischer (Eds), *Development in context: Acting and thinking in specific environments* (pp. 121-153). Hillsdale, NJ: Erlbaum.

Rogoff, B., Radziszewska, B. & Masiello, T. (1995). Analysis of developmental processes in sociocultural activity. In L.M.W. Martin, K. Nelson, & E. Tobach (Eds.), *Sociocultural Psychology: theory and practice of doing and knowing* (pp. 125-149). New York, NY: Cambridge University Press.

Scott, P. (1998). Teacher talk and meaning making in science classrooms: a Vygotskian analysis and review. *Studies in Science Education*, 32, 45-80.

Sutton, C. (1992). *Words, science and learning*. Buckingham: Open University

Vygotsky, L.S. (1962). *Thought and language*. Cambridge, MA: MIT Press.

Vygotsky, L.S. (1987). *Thinking and speech* (N. Minick, Trans.). New York: Plenum.

Vygotsky, L.S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. (M, Cole and others, Eds.) Cambridge, Massachusetts: Harvard University Press.

Wertsch, J.V. (1985). *Vygotsky and the social formation of the mind*. Cambridge, MA. Harvard University Press.

Wertsch, J.V. (1991). *Voices of the mind: A sociocultural approach to mediated action*. Cambridge, MA: Harvard University Press.

Wertsch, J.V. (1998). *Mind as Action*. New York: Oxford University Press.

Wong-Fillmore (1982). Instructional language as linguistic input: Second-language learning in classrooms. In L.C. Wilkinson (Ed.), *Communicating in the classroom* (pp.283-296). Madison: University of Wisconsin Press.



U.S. Department of Education
 Office of Educational Research and Improvement (OERI)
 National Library of Education (NLE)
 Educational Resources Information Center (ERIC)



Reproduction Release
 (Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: ESL Students in a Grade 11 Biology Class: Relationships Between Language and Learning.	
Author(s): Kamini Jaipal	
Corporate Source:	Publication Date:

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, Resources in Education (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign in the indicated space following.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY <hr/> TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY <hr/> TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY <hr/> TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
Level 1	Level 2A	Level 2B
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g. electronic) and paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only
Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.		

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche, or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Signature:	Printed Name/Position/Title: Kamini Jaipal	
Organization/Address: University of British Columbia Department of Curriculum Studies, Fac of Education 2125 Main Mall, Vancouver, BC, V6T 1Z4.	Telephone: 604-2229690	Fax: 604-8224714
	E-mail Address: kjaipal@interchange.ubc.ca	Date: 7 May 2001