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IMPLEMENTING THE COGNITIVE
ACADEMIC LANGUAGE LEARNING APPROACH:
CALLA IN ARLINGTON, VIRGINIA

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Abstract

This article describes the implementation of the Cognitive Academic Language Learning Approach (CALLA), an instructional model that fosters the school achievement of students who are learning through the medium of a second language. Specifically, the CALLA science and math programs for secondary English language learning (ELL) students in Arlington Public Schools are examined with respect to program goals, curriculum and materials development, teacher education, instruction, native language support, parent involvement, and assessment and evaluation. A critical assessment of the success of CALLA's implementation is included.

Introduction

The purpose of this article is to describe the implementation of an instructional model that fosters the school achievement of students who are learning through the medium of a second language. The Cognitive Academic Language Learning Approach (CALLA) was originally developed in 1986 and has continued to be expanded as it has been implemented in bilingual and ESL classrooms (Chamot & O'Malley, 1986; 1987; 1989; 1994).

The CALLA model seeks to assist students learning English become more successful academically by providing them with

opportunities to learn grade-appropriate content, develop the listening, reading, speaking, and writing proficiencies needed for grade-level classrooms, and—most importantly—by focusing on explicit instruction in learning strategies.

CALLA is based on cognitive learning theory in which learners are viewed as mentally active participants in the teaching-learning interaction (see, for example, Chamot & O'Malley, 1994; Gagné, Yekovich, & Yekovich, 1993; O'Malley & Chamot, 1990; 1993). The mental activity of learners is characterized by the application of prior knowledge to new problems, the search for meaning in incoming information, higher level thinking, and the developing ability to regulate one's own learning. The CALLA model suggests ways in which the teacher can capitalize on this mental activity by asking students to reflect on their own learning, and develop a strategic approach to learning and problem solving. Since CALLA incorporates what current research and practice identifies as effective instruction for all students, it can be used by teachers with mixed classes of native and non-native English speakers. CALLA programs are currently being implemented in over 25 locations in the United States and in several other countries in a variety of educational contexts. These include bilingual and ESL programs, elementary and secondary school levels, and teacher education.

This article describes the implementation of CALLA in a school district where I have been personally involved in teacher education, curriculum development, and program evaluation.

CALLA in Arlington Public Schools, Virginia

Arlington is a small suburban school district of approximately 16,800 students located in Northern Virginia across the Potomac River from Washington, DC. Twenty percent of the total number of students in Arlington Public Schools (APS) consists of linguistically diverse students enrolled in the ESL program. About three-quarters of English language learning (ELL) students are native Spanish speakers, less than five percent are Vietnamese speakers, and the remaining represent 51 other languages from all parts of the world. The majority are from families of a low socioeconomic level, and many students have had

either interrupted or extremely limited education in their native countries.

The English for Speakers of Other Languages/High Intensity Language Training (ESOL/HILT)¹ program in Arlington serves approximately 3000 students in elementary, middle, and high schools. Two CALLA programs are components of the total ESOL/HILT program in APS. In 1988, APS received a Title VII Special Alternative Instructional Program (SAIP) grant to carry out a CALLA Mathematics Program and a second Title VII SAIP grant was awarded in 1991 for a CALLA Science Program. As of this writing, the Mathematics Program is in its eighth year, while the Science Program is in its fifth year. Both programs are now supported completely by APS.

Students Served

The focus of each program is on secondary ELL students. About 450 students participate in the Mathematics program and 410 students in the Science program each year. The CALLA Mathematics program serves students who tested below fourth grade mathematics level in their native language at school entry, while the CALLA Science program serves all middle school beginning and intermediate level ELL students and all high school intermediate level ELL students. Thus, the CALLA Mathematics program is aimed at accelerating the progress of students whose mathematics background is below grade level, while the CALLA Science program includes a more heterogeneous mix of students, though most have limited previous study of science.

Program Goals

The purpose of both the Mathematics and Science CALLA programs is to improve student achievement in both the content area and language. To this end, program objectives include: (1) developing and implementing a curriculum that reflects current national guidelines for

¹ The acronym ESOL/HILT (English for Speakers of Other Languages/High Intensity Language Training) refers to the ESL program in Arlington Public Schools.

mathematics and science and that prepares students for successful participation in grade level mathematics and science classes; (2) identifying, acquiring, and developing materials that promote higher level thinking while still being linguistically accessible to students not yet proficient in English; (3) developing teacher expertise in teaching mathematics and science content, designing academic language activities that are integrated with content, and teaching learning strategies; and (4) involving parents in facilitating their children's achievement in mathematics and science.

Curriculum and Materials Development

Teachers and project staff work on summer curriculum projects to identify and sequence curriculum topics and to select instructional materials. The summer curriculum teams have been enhanced by the addition of content specialist teachers to the ESL project teachers, and the curricula developed have been tested in participating CALLA classrooms, then modified or expanded in successive summers. The CALLA mathematics curriculum provides teachers with guidelines for sequencing and teaching the major mathematics topics which students need to know and use in order to transition to grade-level math classes and to pass the state minimum competency examination (Virginia Literacy Passport) required of all students. Included in the curricula are teacher-developed mathematics and science units around major themes presented in the curriculum. These units integrate the content subject with academic language activities and learning strategies instruction and practice. In addition, integrated science and literature units have been developed on the CALLA model, and supplemental word problems appropriate to ELL students' linguistic needs and cultural backgrounds have been produced.

Materials selection and development takes place both in the summer and throughout each school year, with new materials constantly added to strengthen the program. We have found that textbooks are useful mostly as resource books for both students and teachers, since for students learning English it is essential to have experiences with hands-on materials such as fraction blocks and science kits. In the CALLA Science program, for example, the curriculum has been reorganized around a series of science kits which provide hands-on materials and

activities in life, physical, and earth science. Additional materials include Spanish editions of mathematics textbooks, bilingual materials, Spanish encyclopedias, classroom science libraries of trade books, and science apparatus used for experiments and demonstrations.

Development of Teacher Expertise

The key to the implementation of CALLA for mathematics and science in APS has been continuing professional development for teachers. APS CALLA teachers need to acquire two or more new areas of expertise: concepts and teaching techniques for mathematics and/or science (many teachers teach both subjects) and skills in providing learning strategies instruction. Graduate level courses taught by senior project staff have been offered through a local university. These I to 3 credit courses have provided participating teachers with in depth knowledge about the CALLA model and its research base, as well as applications and instructional methods geared to their individual classrooms. The most successful type of course is one which includes both classroom content area teachers and ESL teachers. Content subject and ESL teachers have engaged in collaborative learning experiences, shared teaching approaches, and developed lessons jointly. This interaction, as well as support from content specialists who work with teachers individually, can assist ESL teachers in gaining sufficient content expertise to provide appropriate instruction to their students.

Another major area in which ESL teachers have needed to develop expertise is in learning strategies instruction. Therefore, a second major component of professional development activities is methods of teaching learning strategies. The general framework followed for this aspect of professional development is the 5-phase CALLA instructional sequence of Preparation, Presentation, Practice, Evaluation, and Expansion. In this sequence, teachers first identify and discuss their own learning strategies, then find out about additional strategies that may be useful to their students. They observe and comment on an example of strategy use by the workshop leader, then begin to practice using strategies on their own. Next, teachers work collaboratively to develop a strategies lesson for their own students, and at subsequent workshops report on the implementation of the strategies instruction. Teachers in the CALLA programs have developed various ways to make the learning strategies

more concrete for their students. Posters displaying learning strategies are referred to, or strategy names and descriptions are written on laminated sentence strip cards and used as an instructional focus whenever a particular strategy is introduced or practiced. Teachers also learn how to recognize and encourage strategy use when it occurs spontaneously in the classroom. Finally, teachers are provided with a variety of techniques for assessing and evaluating their students' use of learning strategies.

Other types of professional development activities have included workshops featuring presentations and hands-on activities led by invited specialists and by APS teachers and supervisors. Technical Teams composed of interested ESL and content teachers meet five to seven times a year after school. The topics addressed in these meetings have included curriculum planning, development of criterion-based and alternative assessment instruments, sharing of student work and self-assessments, and practice with instructional materials such as mathematics manipulatives and science kits.

Instruction

The APS CALLA programs feature instructional activities that promote active student participation, such as hands-on experiences, cooperative learning, and higher level questioning. Students have opportunities for working independently on group projects in science, such as building electric circuits, growing plants, or observing the life cycle of butterflies. In mathematics, students develop mathematical concepts through group activities with manipulatives, and solve problems by working in groups to understand the problems and find solutions. A word problem procedure that allows students to work collaboratively on problem solutions has proven successful (Chamot, Dale, O'Malley, & Spanos, 1993; Spanos, 1993). A similar procedure has been developed to assist students in conducting experiments following scientific methodology (Spanos, 1993). Procedures for teaching beginning level ELL students how to develop their own projects for the school science fair has helped ELL students participate in a school-wide activity (Varela, 1993).

Native Language Support

Students in the APS ESOL/HILT program are provided with assistance in their native language in a variety of formal ways, including placement testing in L1, bilingual instructional assistants, bilingual counselors, and bilingual parental activities. One middle school and two high schools offer several required academic courses in Spanish, including science and social studies. A mathematics course is offered in Spanish in the summer. High school students with Spanish language backgrounds can also gain academic credits through the Spanish for Fluent Speakers courses.

Students arriving in Arlington who do not speak English as their native language are evaluated and tested at the Intake Center in both English and their native language if feasible. Assessment instruments are available in Spanish, Vietnamese, Khmer, and Laotian. The purposes of the assessments are to determine the level of English proficiency, and to gain a better understanding of students' level of previous school achievement. This information is useful in determining which students have special needs because of limited prior educational opportunities, and which students are at grade level educationally and only need to develop English proficiency. Student records are analyzed by a bilingual specialist, and parents are interviewed in their native language. In cases of languages not spoken by APS staff, translation assistance is sought from the community or the consulate of the country of origin. APS placement tests assess students' level of reading comprehension, writing, and mathematics in both English and the four main other languages represented in the school population. In addition, an oral interview is conducted in English.

Bilingual instructional assistants in the ESOL/HILT program work closely with teachers and provide extensive native language support to students in ESL classes. They may work with small groups of students to explain a lesson, answer questions, provide translation as necessary, help students with assignments, and suggest areas where students need extra work. Bilingual instructional assistants also share with teachers any student concerns or difficulties experienced that emerge during the small group sessions. Some bilingual assistants were teachers in their native countries and/or have extensive backgrounds in mathematics or science,

and therefore can provide quite substantial input and support for ESL teachers.

The APS ESOL/HILT program employs a number of bilingual counselors to work with ELL students and their families. Their duties include counseling, maintenance of communication with parents, and active involvement in activities concerning parents and special school events. Students are referred to bilingual counselors mainly for discipline problems at school, depression, or because of self-referrals, and home visits are made to the families of students with the most serious problems. An important responsibility of bilingual counselors is to make students and their families aware of community services that can be of assistance to them. Counselors also teach classes in Spanish on topics that include acculturation, substance abuse, and reunited families. Non-Spanish speaking students are provided with this information by their ESL teachers. Parenting classes are provided on a regular basis by bilingual counselors, and include topics on adolescent behavior, acculturation, setting limits, and family life.

Parent meetings and workshops are held regularly, and are conducted bilingually in Spanish and English, since the majority of parents are Spanish-speaking. Non-Spanish speaking parents are provided information in English and their children are asked to explain the information to them. Flyers announcing these events, handouts, activities, sources of community information, and workshop evaluations are all provided in both languages.

Less formal types of native language support are provided by individual teachers through varying amounts of instruction in Spanish and through classroom management structures that make it possible for students to use their L1 in the ESL class. A number of CALLA teachers in Arlington are either bilingual in Spanish and English or else have sufficient proficiency in Spanish to mediate instruction to some degree. These teachers, depending on the concentration of Spanish speakers in their classrooms, may use Spanish to clarify explanations of concepts, especially when working with small groups. They also frequently use Spanish for interactions with students between and after classes, for instance, in inquiring about students' interests or problems, encouraging students to engage in a school activity, explaining a requirement or ways to access a school or community resource. Teachers generally allow students to use their native language (whether Spanish or another

language) when they work together in pairs or in cooperative learning activities. Given this option, students generally choose to use their L1 to clarify a task and explain difficult concepts or new vocabulary to each other. As might be expected, beginning level ELL students use their native language most frequently, and use it for both social and academic functions. With developing English proficiency, however, students tend to use English for most aspects of a group activity, including social interactions, reserving use of the L1 only when necessary to understand and complete the task. When each group reports on its task, the report is presented in English by the group reporter, and often other group members will prompt the reporter with a word or phrase as needed.

Science and mathematics materials in Spanish are collected and distributed to CALLA classrooms for teachers to use as supplementary texts. These materials include mathematics textbooks and workbooks, a NASA science unit on the atmosphere, Spanish encyclopedias, and bilingual dictionaries for classroom use.

Thus, substantial native language support, especially in Spanish, is provided by the APS ESOL/HILT program for both secondary and elementary students.

Parent Involvement

The Arlington ESOL/HILT program has a strong commitment to parental involvement, and the CALLA mathematics and science projects provides workshops for parents that focus on these two areas of the curriculum. The most important reason for building a parent-school relationship is to make parents aware of their own voice in their children's schooling, even though that schooling is being conducted in a language in which the parents may not be proficient themselves. CALLA project staff have made a special effort to attract parents of secondary ELL students to meetings and workshops. Difficulties encountered include the fact that many parents have two jobs, leaving little time for attending meetings, others have no access to transportation, and others may feel intimidated about becoming involved in an unfamiliar situation. In addition, some high school students are not living with a parent, but with an older sibling, a friend, or even on their own. These and other realities can make parent involvement difficult to achieve.

The most effective way to attract parents to workshops and meetings has been through personal contacts from bilingual school personnel and from their own children. Bilingual counselors and instructional assistants telephone parents individually to explain the importance of attending the meeting, and, where feasible, offer transportation. Students are also encouraged to come to the workshop with their parents and bring siblings if they wish, so that the parent workshop meetings become a family affair. A popular incentive to increase attendance is a contest for students on a topic related to what is being studied in mathematics or science. Numerous prizes are awarded at the workshop, but winners must be present at the workshop with a parent or other family member. In a recent example, students in a class which was studying plant growth had to estimate the number of seeds in a sealed seed packet, and the students with the closest estimations won prizes consisting of science activities they could do at home.

At parent workshops ESL teachers and bilingual staff discuss with parents the goals of the CALLA mathematics/science program and explain how parents can help their students become more successful in school. For example, teachers suggest family math activities to be conducted in the native language, or ask parents to watch a science program on TV with their child and then discuss the program in their native language. The effect of these joint parent and student activities is to provide additional avenues of communication between parents and teachers, between students and parents, and between students and teachers.

Assessment and Evaluation

The APS CALLA program has explored various approaches to assessing student progress in content knowledge and skills, academic language development, and use of learning strategies. Criterion-based, standardized, self-evaluation, and performance-based assessments have been used.

Important sources of diagnostic information about students in mathematics and science have been self-evaluation instruments developed for each subject. In these periodic assessments, students are asked to describe what they have learned, what is easy for them, what difficulties they have encountered, which areas they need help in, and

what their attitudes and feelings are about their work in science or mathematics.

In mathematics a criterion-based test was developed, pilot-tested, and revised. The test has three sections: computation, word problems and learning strategies, and mathematics language. The first section assesses students' ability to handle the basic computation skills required for entrance into grade-level math classes. In the second section students work through word problems, then indicate on a checklist which learning strategies were used. The third section assesses students' knowledge of vocabulary associated with mathematics and their ability to comprehend directions and word problems. This criterion-referenced test has been useful in diagnosing students' specific areas of strength and weakness and in making decisions about individual students' readiness to take the Virginia Literacy Passport test and to exit to grade-level mathematics classes.

A standardized test (the California Achievement Test's Mathematics Subtests) has also been used in mathematics as a tool for program evaluation. Evaluations for the mathematics program have shown consistently above-average student achievement in the past four years (Thomas, 1992). Not only have CALLA students made more rapid gains than the national comparison group in computation, they made even greater gains in mathematics concepts and applications. This gain may be a result of the focus on instruction in learning strategies for problem solving in the CALLA mathematics classes.

Assessing student progress in science has proved far more complex than in mathematics. Various standardized multiple-choice tests have been examined and pilot-tested for science, but none has been adequate in assessing student progress in the CALLA science curriculum. Since the program focus is on using science process skills to understand science concepts, performance assessments are a more appropriate measure than tests emphasizing a broad range of content knowledge. Standardized science performance assessments (Riverside Performance Assessments) were pilot-tested, but the reading level required by these tests was much too high for ELL students.

Criterion-referenced performance tests were developed to assess students' understanding of the science concepts studied, use of academic language appropriate to science, and application of learning strategies. In a typical performance assessment in the CALLA science program,

students are first given a problem and the materials needed to solve it. They work collaboratively to develop a hypothesis, conduct an experiment, record their data, and find a solution. Students then write individual reports on the experiment. These are scored using pre-established criteria which include understanding of the scientific concept, appropriateness of procedures, accuracy of observation and recording, reasonableness of solution, language use, and evidence of learning strategies.

In order to evaluate the impact of the CALLA science program, a longitudinal study was conducted in order to track students' progress in grade-level science courses (Galland, 1995). The comparison group consisted of middle school HILT students in the year immediately before the beginning of the CALLA science program. Their school progress in science was followed from 1989-90 when they were in the HILT program through the 1994-1995 school year. The intervention group consisted of students enrolled in the CALLA Science Program in one middle school. These students were followed from the first year of the CALLA Science Program (1990-91) through the 1994-1995 school year. Grades earned in each student's first grade-level science course were compared, and the criterion for success was set at a final course grade of B or better. Twenty-nine percent of the comparison group reached this criterion in middle school science, while only 22 percent reached the criterion when the first grade-level science course was at the high school level. Students who had participated in the CALLA Science Program fared better in their first grade-level science class, with 57% of students in middle school science earning grades of B or above, and 54% of students in high school science classes reaching this criterion.

The results of both the mathematics and science CALLA program evaluations indicate that students are accelerating their learning in both content subjects as well as developing academic language proficiency. Classroom observations and teacher reports also indicate that students are motivated and actively involved in the learning process.

Critical Assessment of CALLA Program Implementation

Experiences in implementing CALLA in Arlington have provided practical information on how the model can be applied in a school

context, and have also revealed aspects of the program which could be improved.

The APS program has shown that CALLA, though originally designed for intermediate level ELL students, can also be successful with beginning level students. In a beginning level ESL classroom the selection of content, academic language activities, and learning strategies needs to be adapted to students' level of English proficiency. Fewer content topics can be addressed, these need to be carefully linked to students' prior knowledge, and the content should be presented through hands-on experiences. Science and mathematics are content areas particularly appropriate for beginning level ELL students. However, more rapid progress in these subjects could be attained through bilingual instruction in which the native language is used to explain new concepts, students develop academic language and literacy in their native language, and learning strategies are explained and practiced with native language tasks. Such a class should make explicit the content knowledge and skills and the learning strategies that can be transferred to English, and provide opportunities for making such transfers. The Citizen's Advisory Committee for Arlington's ESOL/HILT program has recommended that bilingual instruction be made available to Spanish-speaking students in initial high school mathematics courses to help them gain the credits needed for completing the academic high school diploma (ESOL/HILT Citizens Advisory Committee, 1994).

Ongoing professional development opportunities for teachers are critical in successful program implementation, and these activities are most beneficial when both content specialists and language teachers are involved. In general, all teachers need help in methods for teaching learning strategies explicitly. While teachers readily agree to the importance of learning strategies, they tend not to be aware of the degree of explicitness and the amount of practice that students need before they are able to use strategies independently.

The experience of implementing two CALLA projects has clearly shown the importance of close collaboration between ESL and content teachers, resource specialists, and district supervisors of the content areas involved, and integration of CALLA into the total ESOL/HILT program. Where these collaborative bonds are strong, the needs of ELL students are met more effectively both in the ESL program and when

students exit to grade-level classes. In retrospect, more care and attention to involving content specialists should have been given in the early stages of CALLA program implementation.

Successful program implementation also requires ongoing efforts to develop and improve the curriculum and to select and design appropriate instructional materials. School district or state changes in instruction and assessment have also had an impact on the APS CALLA program. For example, when new testing dates were set for the required state competency test, the sequence of the CALLA mathematics curriculum was reorganized so that more test topics would be taught before the testing date. In science, when it became apparent that textbook-based instruction was not appropriate for beginning ELL students, the curriculum was revised to include more hands-on activities and science kits were acquired.

The shift in emphasis in the science curriculum from a content to a process focus has posed a challenge for assessment, since standardized science tests measure primarily discrete pieces of content knowledge. A problem with all science tests designed for native English speakers is that the reading level of grade-appropriate tests, even performance assessments, is far too difficult for ELL students, even when the teacher reads text explanations aloud. What is needed for all subjects are performance assessments in major content areas that have been designed for ELL students and normed with same-aged ELL and native speaker populations.

Parent workshops and other parent involvement activities undertaken by the CALLA program in Arlington have been universally well received by parents, students, and teachers. Unfortunately, due to limited staff and resources, the parent workshops are not held as frequently as needed, and this is an area in which the program should be improved.

As in most school districts, Arlington Public Schools has budget constraints which limit the resources available to special programs. Federal funds have been helpful in setting up innovative programs such as CALLA, and these programs have been maintained after federal funding has ceased. However, staffing has been reduced and annual evaluation curtailed.

The experience of implementing CALLA in a school program has shown that the model is flexible and can be adjusted to meet different

needs, that students find CALLA instruction motivating, and that the model can be effective in helping students become more successful academically.

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