



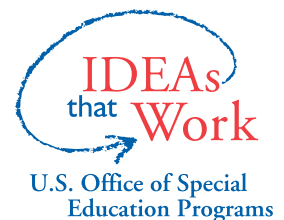
National Center
on Accessing the
General Curriculum

NCAC

Curriculum Modification

Curriculum Enhancement

This report was written with support from the National Center on Accessing the General Curriculum (NCAC), a cooperative agreement between CAST and the U.S. Department of Education, Office of Special Education Programs (OSEP), Cooperative Agreement No. H324H990004. The opinions expressed herein do not necessarily reflect the policy or position of the U.S. Department of Education, Office of Special Education Programs, and no official endorsement by the Department should be inferred.



Curriculum Modification

Prepared by Nari Koga, Boston College and Tracey Hall, Ph.D., Senior Research Scientist
National Center on Accessing the General Curriculum

INTRODUCTION

Modifying existing general curriculum has been an effective way to create more accessible learning environments to support all students and their teachers in various educational contexts. There are many terms in use regarding changes made to curriculum, such as; enhancements, accommodations, overlapping, and adaptations. We differentiate *curriculum modification* from *curriculum enhancement* for the purposes of this paper. In this way, we can clarify the definition and nature of curriculum modification, to emphasize its effectiveness in improving education for all children, and to provide vivid examples and useful resources which will enrich actual classroom practices for diverse learners. Although both ideas, *enhancement* and *modification*, become pivotal when we consider improving accessibilities of general curriculum in relation to individual students' needs, the approach, design, and methods resulted from each idea may differ significantly.

Curriculum *enhancement* is most likely to be built around existing general curriculum and to involve teachers' alterations of curriculum. Frequently, teachers will enhance curriculum with additions of instructional strategies. Frequently enhancements are created to evaluate and teach adequate background knowledge in preparation for a new task. Additionally, teachers may incorporate a variety of instructional materials and procedures to meet students' needs, including the use of co-teaching, and/or instructional collaboration.

Curriculum *modification* differs from curriculum enhancement in that modification is a more extreme alteration to the curriculum than that of an enhancement. Modifications involve combinations of altered content knowledge, conceptual difficulty, educational goals, and instructional method versus building scaffolding and bridges between existing curriculum and people involved in the educational process. Such differentiation between curriculum modification and curriculum enhancement is based on ranging degrees in which our educational approach becomes distinct from or maintains the similarities to existing general curriculum. In other words, educational practices in which students and teachers interactions differ from those designed in existing general curriculum to a greater extent when curriculum is *modified* than when enhanced.

There are numerous ways curriculum modifications are put into practice for different purposes and outcomes in various levels, such as individual, classroom, and school-wide. Due to the flexible nature and countless applications, curriculum modification often remains an ambiguous concept and is understood as an umbrella term to include multifarious aspects of everyday teaching practices. We have refined our definition of curriculum modification based on understandings of its nature and potentialities. The discussion below introduces a way to understand the concept and some concrete practices of curriculum modification through presenting how we have defined curriculum modification, how components can be categorized, what research says about its effectiveness, and how such empirical evidence can be applied to general education settings. We provide in the end, a list of useful Web resources and related literatures for the reader.

DEFINITION

It is important to note that no *single* definition of curriculum modification exists. Many researchers offer many definitions from various fields of discipline. In other words, the practice of curriculum modification has been discussed in different language by many researchers from various specialty areas in education. For instance, in addition to the most frequently used terms, accommodation and adaptation, some use terms such as alteration, differentiation, change, revision, enhancement, compacting, integration and scaffolding to discuss teaching events involving curriculum modification. Another issue is that discussions regarding curriculum modification are often interwoven with ideas of strategy use for intended educational purposes. This creates a situation in which we face the difficulty of separating literature focusing on teaching strategies from those focusing on curriculum modification.

Our challenge is to clarify these ambiguities and to refine the definition of curriculum modification. In this review, we define *curriculum modification as modified contents, instructions, and/or learning outcomes for diverse student needs*. In other words, curriculum modification is not limited to instructional modification or content modification but includes a continuum of a wide range of modified educational components. Similarly, Comfort (1990) defines curriculum modification as “the adapting or interpreting of a school’s formal curriculum by teachers into learning objectives and units of learning activities judged most reasonable for an individual learner or particular group of learners” (p. 397). Curriculum modification involves change to a range of educational components in a curriculum, such as content knowledge, the method of instruction, and student’s learning outcomes, through the alteration of materials and programs (Comfort, 1990; King-Sears, 2001; MacMackin & Elaine, 1997; Reisberg, 1990). Although some may distinguish instruction from curriculum and argue that mere instructional modification should not be considered as curriculum modification, defining curriculum modification requires us to understand curriculum as a broad concept which involves various educational components and people involved in the educational processes. After all, contents, instruction, input and output inseparably construct daily teaching and learning. We also conceive school curriculum as a framework for guiding teachers (Comfort, 1990). In short, the way that we interpret curriculum influences our understanding of curriculum modification. Reisburg (1990) lists examples of *the modifications of content*, such as teaching learning strategies, simplifying concepts or reading levels, teaching different sets of knowledge and skills needed by students, and setting up specific objectives and examples of *modifications to instructional methods*, including reducing distractions, altering the pace of lessons, presenting smaller amounts of work, clarifying directions, and changing input and response modes. All of these teaching events should be considered as examples of *curriculum modification*.

For the purpose of this report, we have adopted the categorization of curriculum modification suggested by King-Sears (2001). King-Sears identified four types of curriculum modification: (a) accommodation, (b) adaptation, (c) parallel curriculum outcomes, and (d) overlapping curricula on a continuum. This categorization represents the relation between modified curriculum and general curriculum in terms of differences and similarities in educational input including content knowledge and conceptual difficulty, educational output including educational goals, and methods of instruction. The extent to which the modified curriculum differs from the general curriculum becomes greater as educational practice moves from accommodation to overlapping curricula. For instance, in accommodation, the only educational components which may differ from general curriculum are instructional method and educational goals, whereas, in overlapping curricula, all components—input, output, and instructional methods that students receive—can be totally different from those designed in general curriculum.

As conceptualized in this continuum, curriculum modification that King-Sears suggests contains a wide range of educational practices and shares the essence of the fore-mentioned definition of curriculum modification; *modified contents, instructions, and/or learning outcomes for diverse student needs*. Modifications identified by King-Sears, for example, range from an educational practice of simply providing a book-on-tape to some students who have reading difficulties during reading lessons to an educational practice of having some special needs students work on individual (IEP) goals, such as following directions, while they engage in general science lessons. Moreover, these four types of curriculum modification, according to King-Sears, are the extensions of curriculum enhancement within the process for teachers to determine the degree of accessibility of their classroom students with disabilities. In other words, curriculum modification, in King-Sears' view, is a suggested step to take when curriculum enhancement alone is not effective to achieve objectives for inclusion.

King-Sears' clear categorization and analysis of the components of curriculum modification is valuable for educators to capture the essence of curriculum modification. As stated above, her categorization consists of a wide range of educational practices. Since curriculum modification is practiced in numerous ways, it is important to broaden the definition rather than limiting to particular events.

COMPONENTS AND FEATURES

As noted above, the components of curriculum modification are well categorized by King-Sears (2001) into four types: (a) accommodation, (b) adaptation, (c) parallel curriculum outcomes, and (d) overlapping curricula. Switlick (1997) explains that the purpose of modifying curriculum is "to enable an individual to compensate for intellectual, physical, or behavioral challenges" (p. 236) and to create learning environments which "allow the individual to use existing skill repertoires while promoting the acquisition of new skills and knowledge" (p. 236). We need to understand that these are the purposes which underlie the four types of curriculum modification identified by King-Sears (2001).

In the following section, brief explanations of each type of curriculum modification with examples from actual classrooms are prepared. Actual educational practices reflecting modified curriculum vary in many ways, modification occurs in various educational settings across diverse subject areas, students, assignments, assessments, evaluations, and so on. Presenting examples for *all* educational situations is beyond the scope of this report. Therefore, we selected a range of examples across four types of curriculum modification with a special focus on the examples from integrated general classrooms. For instance, the section regarding accommodation involves an example of using assistive technology in writing class for students with learning disabilities, and an example of using book-on-tapes for English Language Learners in a reading lesson. Likewise, various settings (math, language arts, social studies, and science lessons) and learners; students with a moderate to severe disabilities, as well as students identified as gifted and talented appear in the examples presented across the four types of curriculum modification.

Following the description and examples of each curriculum modification type is a table illustrating comparisons among four types of curriculum modification in relation to components modified and the extent to which modified curricula differ from the general curriculum. The table helps us visually recognize that, as we move forward from accommodation to overlapping curriculum, focused components shift from instruction-oriented to content-oriented, and that educational practices reflecting modified curriculum become more distant from educational practices based on general curriculum.

Accommodation

The term accommodation is used to mean a modification to the delivery of instruction or method of student performance and does *not* change the content or conceptual difficulty of the curriculum (see Table 1). Both teachers and students can play a role in the changes of instructional methods in order to achieve the same intended instructional outcomes suggested in general curriculum. Examples of accommodation are countless. Some include; incorporating different types of teaching devices and techniques, such as audiotape, technology, graphic organizer, and pictorial representation, and changing the amount of input, time frame for learning, and levels of support for individual students' needs.

Among these examples, using assistive/adaptive technologies typically exemplify an accommodation to general curriculum. Bray, Brown & Green (2004) define assistive/adaptive technologies as “content-free technologies” (p. 34) which does not address curriculum or promote specific learning, but rather help students overcome the inaccessibility due to individual differences. In an actual classroom, a student with physical disabilities may use a computer input devices, such as a *trackball*—a mouse which require less hand movement—and *BigKeys*—an alternate keyboard with extra large keys—to complete his/her writing task. In this case, the content and difficulties of tasks remain the same as the tasks in which other students in the class engage. An accommodation through the use of assistive/adaptive technologies allows students to complete their tasks required in general curriculum, which would be difficult to complete otherwise.

Another example of accommodation is making available for students who are English Language Learners (ELL) and students with print disabilities audio versions of books when they engage in reading sessions focusing reading comprehension skills. Instead of providing the traditional written form of text, teachers can have these students work individually or in a small group to read an assigned book with auditory support. Again, through this type of accommodation, students with diverse needs can acquire same content knowledge as other students and move onto the next stage of learning with them. In the case of ELLs, they can comprehend the text with audio support, and then participate in the follow-up activities with other classmates based on their understanding of what was read. Frequently, teachers regard ELL students' developing language proficiency as a disadvantage, which causes a necessary lag-behind (Valdes, 2002). As a result, teachers may provide curriculum modification with more content focused alteration, which simplifies the content, may change the standards and goals, does not provide enough cognitive challenge and academic stimulus, and does not help their acquisition of the English language. Although it is important to understand that acquiring a second language, especially academic language, is not a quick fix and takes many years of instructions (Cummins, 2000), teachers also need to know that ELLs, like other general students, should receive an appropriate cognitive challenge with appropriate conceptual difficulties and a sense of belongings to their class regardless of their developing language proficiencies (Igoa, 1995). When used with the students with appropriate language proficiency levels, an accommodation to general curriculum can be a powerful tool to support ELL students' unique linguistic, academic, and social needs.

Switlick (1997) has listed other examples of accommodations, such as requiring completion of every other word problem on a math worksheet, and providing for oral performance instead of written. As we see in these examples, accommodation is not a change of educational input designed in general curriculum, such as content knowledge and conceptual difficulty of the subjects. Rather, accommodation is a modification of instructional methods intended to meet individual student's needs of acquiring necessary input from lessons. The information that

students receive remains the same. However, an accommodation to curriculum modifies the way that students acquire and/or respond to the information.

Another important point to add is that the intended goals of accommodated curriculum may change from those of general curriculum depending on educational contexts. For instance, using a book-on-tape in a reading comprehension lesson creates an opportunity for students to use their listening skills in addition to reading or decoding skills. If the students were English-speaking children with reading difficulty who already established English listening skills, the intended goals of curriculum remain the same as those in general curriculum. However, if the students were ELLs who are still on a process of developing their listening skills, teachers can indicate an additional goal for them, which is the development of listening skills. Thus, accommodation has a flexibility of adjusting intended educational goals based on the contexts.

Adaptations

Adaptation is a modification to the delivery of instructional methods and intended goals of student performance that does not change the content but does *slightly change* the conceptual difficulty of the curriculum (see Table 1). Adaptations usually require more teacher effort and time than simply changing instructional methods or access as in an accommodation. An adaptation is a goal-driven process: in order to decide on an adaptation to curriculum, teachers first need to specify intended goals for individual students. Again, examples of adaptation abound and some of the examples include providing differentiated activities, homework and evaluations, and using adapted or different instructional materials and activities for individual students.

Adaptations in integrated general classrooms often occur when teachers differentiate instruction. For instance, teachers can create writing lessons which meet individual student's unique needs by having students work on adapted assignments. While some students are engaging in a writing assignment individually, students with learning disabilities may work on their assignment in a small group with teacher support. The teachers may also modify the content of the writing activity depending on students' needs. While the teachers require some students to compose using the five new vocabulary words from the lesson, the students with a learning disability **may** select three of the 5 new words from the lesson and make appropriate use of them in the context of their work. King-Sears (2001) suggests that a variation of this type of lesson can be providing students with disabilities fewer work or practice tasks. She also points out that reducing the amount of tasks seen in an accommodated instruction should be differentiated from that provided in adapted instruction. On the one hand, the *accommodated* instruction may modify the amount of tasks, for instance, teachers provide only 5 math problems to students with math difficulties while other work on 10 problems without changing the conceptual difficulty of the problems. On the other hand, the *adapted* instruction involves a slight change in conceptual difficulty to meet students' needs.

In another example provided by King-Sears (2001), the math teacher may instruct a student with a disability to work on mastering division of mixed fractions with like denominators while other students work toward mastering division of mixed fractions with unlike denominators. In this case, the conceptual difficulty that the students with a disability need to acquire slightly changes although the content knowledge of mathematics, namely the concepts of divisions and fractions, remains same. Switlick (1997) suggests other examples, including providing picture word cards for key words in a story and using a calculator to complete a math assignment. Switlick also provides an adaptation planning worksheet (Figure 9-1, p. 245, 1997) for teachers who are interested in incorporating adaptation into their instruction.

Thus, adaptation involves not only the modification of instructional methods but also includes a slight change in conceptual difficulties introduced to students. Like accommodation, adaptation occurs within the same learning contents. In many cases, adaptation should be practiced when teachers determine that a student is able to learn the same content knowledge as other students if a slight change is made to modify conceptual difficulty.

Parallel Curriculum Outcomes/Parallel Instruction

Parallel curriculum outcomes are modifications to the delivery of instruction and intended goals of student performance. Like adaptation, parallel curriculum outcomes do not change the content knowledge and the underlying principle of the educational goals for individual students. The difference between adaptation and parallel curriculum is the extent of change in conceptual difficulty. While adaptation slightly changes the conceptual difficulty of curriculum, parallel curriculum outcomes involves a *significant change* of conceptual difficulty (see Table 1).

Similar to accommodation and adaptation, the practice of parallel curriculum outcomes depends on the educational contexts and individual student needs. There is a range of application to this type of modification and students with varying learner characteristics and abilities benefit from parallel curriculum outcomes. For example, many students identified as gifted and talented require more advanced or challenging conceptual difficulties in instruction and application. Therefore, the significant change of conceptual difficulty seen in parallel curriculum outcomes often suits the curriculum modification for these students. Many educators synonymously use the term *enrichment*, with the term parallel curriculum outcomes when addressing such curriculum modifications.

Students with varying disabilities also benefit from the parallel curriculum type of modification. For instance, King-Sears (2001) described a classroom situation in which most students develop science projects that include analysis of cause-and-effect problems. In the same classroom, a student with multiple disabilities may engage in a science project with a focus on one experimental process. In this way, teachers are able to include the student with multiple disabilities in the same content lesson as all students and support the student(s) with disabilities so that she/he may achieve the appropriate educational goals. Other examples suggested by Switlick (1997) include providing special needs students in English/Language Arts classes a paper with all or part of the story and asking them to locate target words or letters while other students are reading the story; having students with special needs complete worksheets for counting from 1 to 10 while other students are assigned math worksheet on fractions; and allowing some students to orally report three things remembered from listening to others reading the newspaper in citizenship/current events class, while other students read aloud and answer a series of questions.

Thus, parallel curriculum outcomes do not change the broader content knowledge but significantly change the *conceptual difficulties* for students. The educational practices categorized under parallel curriculum outcomes closely connect to what Switlick (1997) described as a concept of “partial participation” (p. 236)—an underlying concept associated with modification. Switlick explains that we fundamentally believe that it is appropriate for diverse students, especially students with severe disabilities, to participate in the general education classroom even though they may not acquire the same level of conceptual difficulties as other classmates, and that teachers can pursue this practice by applying parallel outcomes/instruction curriculum modifications. As Switlick indicates, the use of parallel curriculum outcomes is a modification which “goes a step beyond what is usually considered when adapting instruction” (p. 244). Modifying the conceptual difficulty of curriculum in a significant way creates a

learning environment in which we can broaden the idea of inclusion to a wider range of diversity among students.

Overlapping Curricula/Overlapping Instruction

Overlapping curricula is a modification to curriculum such that the modification creates *overlapping* or *common* goals for learning outcomes of diverse students. Overlapping curricula is not a direct modification of general curriculum. Rather, it is an incorporation of specific individual goals and expectations for students with diverse needs. Teachers can practice overlapping curricula when the specific goals are expected to be accomplished in general education. Overlapping curricula enables the diverse students to be involved in general education curriculum activities and promotes the idea of partial participation. There are various ways to practice overlapping curricula. In most cases, the components of curriculum, such as background knowledge, conceptual difficulties, and methods of instruction, for special needs students are designed very differently from those for general education students (see Table 1). Practicing overlapping curricula sometimes requires teachers to creatively design and provide shared educational activities, such as cooperative learning and peer-mediated interventions. In such shared activities, the educational goals and expectations for the students with diverse needs overlap with those for general education students.

While the students with diverse needs are learning to achieve their individual educational goals, for instance vocational and social skills development, they also are able to be involved in the same content lesson with their general education classmates. Based on the modified intended educational goals, educational input (content knowledge and conceptual difficulty) and instructional methods become different from those designed in general curriculum. King-Sears described an example in which a student with emotional disturbance may have an IEP goal to develop appropriate interactions with peers in a small group setting. Although this student may never engage in social studies activities at the same conceptual levels as other students or never develop content knowledge in the subject, teachers can provide him/her with an appropriate task to complete in a small group in order to create an opportunity to learn how to interact with others. When the general curriculum also focuses on students' interaction as one of the intended goals for the social studies lesson, there is an overlap evident between the intended goals for students with special needs and those for regular students. In short, this type of modification allows students with specific needs to be involved in general education curriculum activities while accomplishing different curriculum goals.

The following example depicted in Switlick (1997) clearly describes a classroom practice using overlapping curricula. The student, Jamie, in this example has objectives to make eye contact and acknowledge an interpersonal interaction using audible sounds:

Jamie has a tray on his wheelchair. He holds on his tray the manipulatives students are using during math class. As students pick up their materials from Jamie's tray, they speak to Jamie. To meet his instructional goal, Jamie should look at each student and acknowledge the greeting with an audible sound. The same interaction is duplicated as students exchange materials and return materials (p. 246).

Thus overlapping curricula provides Jamie the opportunity to practice appropriate social interactions with peers in the general classroom setting. At the same time, his peers also benefit from the social interaction and are able to prepare their manipulatives and engage in a math activity efficiently with Jamie's help.

Like other types of curriculum modification, accommodation, adaptation, and parallel curriculum outcomes, examples of overlapping curricula can be innumerable. Additional examples from the work by Switlick (1997) include having a student with a severe physical disability use an adaptive switch to activate the recorder and work on holding up his head for increased amounts of time while other students are tape recording a rough draft of a play they are creating, and having the same student make sure everyone in the class has a test tube and a worksheet while other students are engaging in a chemistry experiment in small groups.

As we see in these examples, the educational practices in which the student with special needs engage for their intended goals and those in which general education students engage for their intended goals may create mutual benefit due to the overlap evident in their goals. Through applying overlapping curricula to general curriculum, teachers are able to create a learning environment where students with special needs play meaningful roles in a classroom and where not only students with special needs learn from being included in a general classroom but also the general education peers have an opportunity to learn and receive supports from the students with special needs.

The following table contains the four types of curriculum modification features described above. The first column contains a list of the modifications and the top row contains curriculum components; content knowledge, conceptual difficulty, intended goals, and method of instruction. If a modification is evident in certain components, the table shows the extent of modification, for example, slightly or significantly. This table serves as a summary for the ideas of curriculum modification and to learn the characteristics of each type in order to select which type would be most beneficial to students.

Table 1.
Curriculum Components

	Content Knowledge (input)	Conceptual Difficulty (input)	Intended Goals (output)	Methods of Instruction	
Types of Modification	Accommodation	Same as general education curriculum	Same as general education curriculum	Same or modified	Modified
	Adaptation	Same as general education curriculum	Slightly modified	Modified	Modified
	Parallel Curriculum Outcomes	Same as general education curriculum	Significantly modified	Modified	Modified
	Overlapping	Different	Different	Modified	Different

These explanations of four types of curriculum modification with the visual support of the table help to illustrate how the extent of changes to curriculum varies among the four types of curriculum modification categorized by King-Sears (2001) and Switlick (1997). As described, the extent of change shifts from less to more as we move forward from accommodation through overlapping curricula. The demands for teacher time and energy for planning and conducting lessons may also increase as we shift from modifying instructional methods for accommodated

curriculum to creating individual lessons for overlapping curricula with application in general education lessons with overlapping educational goals.

Although it seems to be true that accommodation is a less elaborate type of curriculum modification and that overlapping curricula is the most elaborate type contrarily, the degree to which each modification type is different from general curriculum does not correspond to the degree of supports needed by individual students. In other words, an accommodation can be an excellent tool to instruct students with severe disabilities who need extensive amounts of support, whereas students with minor disabilities may benefit from overlapping curricula depending on each individual student's educational goals and the instructional episode.

The educational practices for all types of curriculum modification are as diverse as the educational contexts, including subjects, settings, and students. In fact, classroom teachers may practice different types of curriculum modification in a combined manner. In other words, we can easily imagine that a student who benefits from adapted curriculum may also receive positive supports from other types of curriculum modification. Also, in the classroom where differentiated instruction is practiced, various modifications may take place concurrently.

Categorizing each type of curriculum modification is extremely useful for teachers to understand the nature and potentialities of curriculum modification and to incorporate their understandings into actual classroom instructions. However, we should keep in mind that the success of modified curriculum requires teacher flexibility in instructional practices and broad views of curriculum itself. The next section will introduce literature providing empirical evidence of curriculum modification for diverse students.

EVIDENCE OF EFFECTIVENESS

The empirical evidence regarding the effectiveness of curriculum modification is available in many studies. The following sections includes the literature review of 13 recent empirical studies issued between 1989 and May, 2004, which report the impact of curriculum modification on various areas of interest, and 4 conceptual studies relevant to the empirical findings. For the purpose of this report, which is to display empirical evidences of effectiveness, our main focus is on the empirical findings and we use conceptual studies to supplement the background of reviewed empirical studies. A total of 17 studies were identified and then organized into three major categories by the areas of impact for which the modified curriculum was designed: (a) modification designed for students' learning, (b) modification designed for behavioral reasons, and (c) modification designed for inclusion. The majority of the studies are the articles from major peer-reviewed journals, such as *Academic Therapy*, *Bilingual Research Journal*, *Behavioral Disorders*, *Journal of the Association for Persons with Severe Handicaps*, *Learning Disabilities: A Multidisciplinary Journal*, *Journal of Applied Behavior Analysis*, *Equity & Excellence in Education*, *Journal for Education of the Gifted*, *Gifted Child Quarterly*, *Journal of Early Intervention*, *Teacher Educator*, with a few exceptions from books.

Modifications Designed for Students' Learning

In nine of 17 studies reviewed, the authors focused on demonstrated effectiveness of modifications designed for student learning, which include 7 empirical studies and 2 conceptual papers. This section contains three subsections based on the types of diverse students, namely general education students, English Language Learners, and gifted and talented students.

Modification for General Education Students

We found 2 empirical studies comparing the effect of modified curriculum to that of regular curriculum on general students' learning performance, including engagement, motivation, and achievement as well as teacher perceptions regarding the use of modified curriculum (Tieso, 2001). The number of studies focusing on the effectiveness of curriculum modification for general education students alone is limited since a majority of studies in this topic target student populations in need of modification to existing general curriculum. Tieso's (2001) qualitative study involved 12 mathematics teachers from different school sites (2 teachers used regular textbook curriculum, 10 teachers used the modified curriculum). From these classrooms, 6 students in grade 5 through 8 were selected for interviews. During the 3 weeks of data collection, Tieso investigated teacher and student perceptions regarding the necessity and effectiveness of modified math units and the academic achievements of the students after receiving the modified units. The curriculum was redesigned so modified units would provide enhanced learning objectives, authentic resources and assessment techniques, engaging lesson introductions, and include an emphasis on the major principles and concepts of the discipline. The existing units of study were carefully aligned with constructivist teaching and learning activities and the teachers received trainings in curriculum modification. Data were collected through individual interviews, focus groups, observations, and examinations of students' artifacts.

The authors reported that teachers perceived the modified unit as more effective in motivating and engaging students. The modified unit also seemed to meet the needs of all students by challenging the students and posing high expectations. Based on these results, the author's indicate that students believed the modified units were more fun, complex, engaging, and challenging than regular textbook unit. Additionally, the students showed pride in completing their final projects. In summary, the author stated that teachers and students preferred the modified unit, which involved hands-on activities, the infusion of writing into the math curriculum, the opportunity of collaboration among students, and the comprehensive and authentic nature of the final project.

A second study on curriculum modification by Moon & Callahan (2001) researched the effectiveness of curriculum modification on general education student's learning achievement. In this 2-year longitudinal study, a mixed method, curriculum modification was one of the interventions designed for a project called Support To Affirm Rising Talent (START). The subjects included 273 elementary students with diverse backgrounds in terms of race, ethnicity, and socio-economic status. The students were first or second graders from 16 schools in an urban school district and more than a half of them were from low-socioeconomic environments. Curriculum modification in this study followed a constructivist approach, which emphasized a student-centered approach in modification. Curriculum modification involved various components of learning in daily classroom activities. Some modification practices included organizing lessons relevant to student's lives, considering a pattern of classroom interaction, using materials familiar to students from varied cultural backgrounds. During the implementation of this curriculum modification, student's academic achievement was measured using a standardized norm-referenced measure in basic-skills (vocabulary, reading, language arts, and mathematics).

The author's summarized their results as follows. In combination with other interventions incorporated in the START project, such as family outreach program and mentorship, curriculum modification positively affected the improvement of students' academic achievement, especially students identified as at-risk for academic failure. Students' identified as at-risk were on grade

level by the end of the project and the effectiveness of intervention was evident one year after the project was completed.

Thus, these two empirical studies showed some positive effects of curriculum modification for students' attitudes towards learning and their academic achievement. Considering the scarceness of empirical studies emphasizing the potential effectiveness of curriculum modification on all students, the significance of their studies is in their focus on diverse students in general education classrooms. Although Tieso's study did not discuss the diversity among the subjects, the subjects in the study by Moon et al., (2001) involved diverse students with various ethnic, cultural, and socio-economic backgrounds. Their findings suggest that, when the design is student-centered and the practice is individually-focused, curriculum modification is effective for all students regardless of their backgrounds. We are encouraged by these promising studies. However such a small sample is inconclusive and we recommend additional research to be conducted with a focus on student groups who require modified curricular units to access general curriculum.

Modification for English Language Learners

We found 2 empirical studies (Buxton, 1999; Fradd, Lee, Sutman & Saxton, 2001) and a conceptual study (Sparks, 2000) specific to students identified as English Language Learners (ELLs). The researchers focusing on curriculum modification for ELLs suggested that integrating students' unique linguistic and cultural backgrounds into curriculum is a key to make modified curriculum function successfully.

The first study was designed to demonstrate that the effectiveness of a modified science curriculum on the accessibility to inquiry-based science curriculum for ELLs as well as regular English-speaking students (Fradd et al., 2001). Curriculum modification, in this study, was a part of two large scale science projects, the Promise Project and The Science for All Project.

Fradd's Promise Project, involved 502 students in grade 4 with different linguistic and cultural backgrounds, including bilingual Hispanic, Haitian, and English speaking children, and their teachers who share students' language and culture. The researchers and teachers modified the curriculum to incorporate more open inquiry, as a result, students' academic achievement reflected in test scores improved. Teachers' insights contributed to identify the transitions and instructional materials required to move to the modified open inquiry. Teacher's knowledge of their students' language and culture also helped to identify students' specific needs.

The Science for All Project, was a 3-year longitudinal project involving 900 students in grade 4 and their teachers. In this project, the science curriculum was modified such that inquiries would develop through a continuum of experiences ranging from scaffolded explicit instructions to student-initiated inquiries. The process of curriculum adaptation involved the integrating specific linguistic components for the language and literacy development of ELL students. For instance, the modified curriculum incorporated the learning of specific language functions, such as describing, reporting, or explaining, and the promotion of vocabulary development in both English and the students' native languages. The modified curriculum also involved providing instructions with multiple representational formats, such as drawings, charts, tables, graphs, and computer-developed simulations. Such modified curriculum contributed to develop inquiry-based science curricula for the ELLs and to increase academic achievement. The authors stated that "despite contextualized learning through hands-on activities, the benefits of science inquiry for ELLs may be limited without a concomitant focus on literacy development" (p. 493).

Although the major focus of this study was on the modification of materials, the results suggested that teachers' perceptions regarding the effectiveness of curriculum modification shifted from uncertain to preferable, and that such a positive shift of teacher perceptions would affect the successful practice of modified inquiries. This author also suggests that teachers can modify curriculum in a particular subject area with the input obtained from different subject areas. A crucial point is for teachers to consider fulfilling students' needs using whatever available input from the learning contexts. The results of this study indicate that the ELL students' academic success in science was closely connected to their language and literacy learning, and that those students with diverse linguistic and cultural backgrounds benefit from the modified curriculum when their unique linguistic needs are integrated in curriculum. Existing modification strategies or instructional strategies identified as effective for a wide range of students may not support ELL students when their language proficiencies are not taken into account.

In another study, Buxton, reported that integrating ELLs' cultural backgrounds is a key point for teachers to consider when modifying science curriculum (Buxton, 1999). In this 3 year longitudinal study, the researcher examined the effectiveness of modified science curriculum designed within a project called the Science Theatre Project. The modified science curriculum involved a computer-based instructional methodology with an inquiry-based and student-generated computer models. The purpose of this study was to examine how modified curriculum affected the students' learning and understanding of science inquiries and interactions. The subjects involved 26 students in grades 2 and 3, including Spanish-English bilingual children and English monolingual children in a two-way bilingual program. The underlying assumption of this study was that personal understandings of how science is practiced play an important role in students' academic success in science, and this assumption is evident in Buxton's statement, "the cultural and linguistic backgrounds that many of these students bring with them to school stress methods of argument, proof, and understanding of the natural world that are significantly different from the logico-deductive western epistemology that has given rise to modern science" (p. 148).

Qualitative data were collected through ethnographic field notes, classroom artifacts, and individual interviews with students and teachers. The results showed that the use of computer models was beneficial for the students' developing conceptual abilities, and that the change of students' conceptual abilities was essential for the creation of successful models. The significance of this study is the emphasis on student's and teacher's roles. Buxton emphasized that curriculum modification needs to be student-centered in a way that the content of modification is connected to students' own lives, and that students need to understand the value of their prior experiences and to help teachers tailor the instruction. Only when cultural backgrounds of ELL students are acknowledged and integrated in curriculum modification, they will have a learning opportunity to comfortably use the language of science as a discourse of engagement in activities and to engage in content-based interactions with others.

The ideas from a conceptual study done by Sparks (2000) reinforces the importance of integrating students' cultural backgrounds into curriculum modification. In his study, Sparks specifically focused on Native American students. He suggests that curriculum can be enhanced through a process of incorporating Native American students' culture in the classroom curriculum, what he calls "cultural infusion" (p.263). Cultural infusion is a way that students do not change their cultural beliefs but adapt to specific situations and acquire necessary coping skills. Based on his teaching and research experiences, Sparks asserts that school failure is less likely to occur and student's self-esteem increases when their culture is successfully incorporated

into the modified curriculum. He suggests that, for the culture-specific approach for curriculum modification, educators need to consider the following principles: (a) learning about student's lives, including specific tribe culture and individual family lives, (b) building the curriculum on positive images of student's culture not on negative stereotypes, (c) developing cultural sensitivity, and (d) learning about the characteristics of Native American learners, such as their visual presentations of knowledge, their lives in a highly oral culture, their preference of simultaneous processing rather than sequential processing, their preference of hands-on technique, their cooperative rather than competitive learning environments, their concepts of time and space, and so on.

Thus, the focus among the studies regarding effectiveness of curriculum modification for ELL students are on the importance of integrating student's linguistic and cultural backgrounds into a modification process. A common suggestion evident among these studies is that teachers need to understand the characteristics and specific needs of particular groups when determining how curriculum should be modified. In addition, to adopt the modification practices benefiting all students, such as student-centered and individual-focused, teachers need to apply their knowledge of specific linguistic and cultural needs of ELLs. It is important for teachers not to stereotype the needs of a specific group; however, it is also crucial for teachers to learn that curriculum modification does not meet its success without special attention paid to unique needs of students: language proficiency and cultural backgrounds in the case for ELL students.

Modification for Gifted and Talented Students

We found 3 empirical studies (Olenchak, 1990; Olenchak & Renzulli, 1989; Reis, Westberg, Kulikowich & Purcell, 1998) and a conceptual study (Johnson, 2000), which focused on the effectiveness of curriculum modification designed as a part of a school-wide program for students identified as gifted and talented, the Schoolwide Enrichment Model (SEM). Johnson (2000) described the concept of SEM in his conceptual study. According to Johnson, the SEM has three components: (a) organizational components which include schoolwide enrichment team of teachers and parents, (b) structural components which include the regular curriculum, enrichment clusters, and a continuum of special services, and (c) instructional components which include the delivery of enriched instruction and teacher trainings. Curriculum modification with respect to these components focuses on student's strengths and interests and includes teacher-directed modification of specific knowledge, methodology, and application in the prescribed curriculum. The components to be modified include instructional objectives and strategies, content, processes, product, and affect.

Johnson introduced two techniques of curriculum modification: (a) curriculum compacting, which is "the elimination of content that a student has previously mastered or to streamlining content so that it commensurates with a student's level of motivation and ability" (p. 52) and (b) integrated instructional themes which is a cross-subject thematic integration of curriculum based on student's interests in their total talent portfolios. The underlying ideas of curriculum modification in the SEM is that the effective curriculum emphasizes both content and process, develops inquiry, and establishes the interconnectedness of knowledge and skills.

We found three studies which examined the empirical validity of the SEM. (Olenchak, 1990; Olenchak et al., 1989; Reis et al., 1998). First, Olenchak et al., (1989) found that a year-long application of SEM to 1,698 elementary school students (K-6) was effective on positive changes in student and teacher attitudes toward overall learning and the concept of gifted education. In this study, the researchers used a series of qualitative research methods to investigate the change in: students' creativity; the students', principal's teachers', and parents' attitudes toward

learning; the evidence of school-wide change resulted from the SEM. The qualitative methods included interviews, observations, logs, and analyses of students' products. Curriculum compacting following the basic principles described by Johnson (2000) was employed in the SEM process. The authors report that students' creative productivity increased and that there were significantly positive changes in attitudes towards overall learning and gifted education among the participants. Thus, the authors demonstrated the effectiveness of the SEM for not only gifted and talented students but for other students in a school-wide level. This study also contributed to the notion that the concept of curriculum compacting in gifted education needs to be widely acknowledged as a benefit to diverse students as well. After experiencing the SEM, one of the principals in this study commented, "having much more impact on the school than ever before because kids, regardless of scores and grades, can possibly achieve high quality work in an area they love" (p. 43).

Similarly, Olenchak (1990) reported that curriculum modification provided in the SEM positively affected attitudes toward learning in a study with 1,935 middle school students. In this two-year longitudinal study, Olenchak implemented a mixed research method to investigate the extent students' attitudes towards learning process varied when he compared different affective variables, such as grade level, classroom teachers, learning climate, instructional styles, and enrollment in SEM program, and what aspects of SEM students perceive most positively, and what are the differences between SEM and other school programs.

A qualitative regression analysis was used to investigate students' attitudes and the relations between their attitudes and other variables, while a qualitative analysis revealed student's perceptions of SEM. Over all, the authors reported results in which all students developed more positive attitudes towards learning through being enrolled in the SEM, and that the students found clear differences between SEM and regular school programs in a way that they were able to engage in more teacher-supported school activities and to pursue self-selected interest-based studies. Thus, the author raised questions regarding the limited views on gifted education, such as the idea that gifted education is only for the specific group of talented students, and also revealed that SEM would benefit all students in schools while the gifted and talented students continue to achieve their goals in general education classrooms.

Another empirical study showed the effectiveness of curriculum compacting on the achievement test scores of gifted and talented students (Reis et al., 1998). The difference between this study and other two empirical studies described above is in its specific focus on curriculum compacting. While the other two studies described the effectiveness of curriculum modification implemented as a part of a large program, the SEM, the researchers in this study investigated the issues regarding curriculum compacting itself, such as the differences in academic achievement of students who received curriculum compacting and that of students who did not.

The subjects of this study involved 336 gifted and talented students in grades 2 to 6 from various school settings, including rural, suburban and urban settings. Curriculum compacting in this study involved eliminating 40 to 50% of already learned curricula for these gifted and talented students. The ITBS in students' grades and the same assessment in one grade higher were used to assess student's academic achievement in language arts and mathematics. Reis et al., (1998) found that compacting curriculum did not have negative effect on student's academic achievement as the results showed that there was no significant differences in academic achievement between the students who received curriculum compacting and those who did not. In other words, the students, who received curriculum compacting, performed as well as the other students who received standard curriculum in achievement tests. Although the findings of

this study did not assure the long-term effects of curriculum compacting on student's learning achievement, they did contribute to reducing teachers' fears about negative impact of eliminating contents from existing curriculum.

All of these studies found the effectiveness of curriculum modification represented as curriculum compacting. Two of 3 studies (Olenchak, 1990; Olenchak et al., 1989) were large-scaled longitudinal investigations and all studies focused on the investigations in a school-wide level. There are some significant contributions that these studies can offer to our understandings of effective curriculum modifications. First, considering the fact that more studies regarding curriculum modification have been conducted in smaller scale studies, such as case studies and class-wide investigations, this area of study focusing on gifted and talented students and the SEM contribute significantly to the field by presenting the empirical evidence collected from large samples and school-wide settings. Second, when we understand the SEM as an application of gifted education to the general education classrooms, these studies provide the rationales to go beyond the limited perception of gifted education and implement the SEM for all students. The findings of these studies expand the potentialities of an educational practice which was originally designed for a specific group of students. The limitation found in these studies includes their categorization of students. Besides gifted and talented students, the researchers tend to categorize other students as simply others in a control group. Further research is needed to investigate the effectiveness of SEM and curriculum compacting through focusing on specific groups or individual students with unique needs.

The empirical studies reviewed in this section, *Modification for Student's Learning*, demonstrated the effectiveness of curriculum modification on learning achievement and perceptions of students with diverse linguistic, cultural, ethnic, academic skills, and socio-economic backgrounds. In contrast to the fact that many teachers are practicing curriculum modification formally and informally in their everyday classroom teachings, a small number of empirical studies provide evidence for the effectiveness. We need more empirical studies, which examine the effectiveness of curriculum modification in a wider variety of educational settings with a wide range of students (e.g., grade, ability, culture, and ethnicity).

Modifications Designed for Behavioral Reasons

Five of 15 studies demonstrated effectiveness in students' behavior management (Clarke, Dunlap, Foster-Johnson, Childs, Wilson, White & Vera, 1995; Dunlap, Foster-Johnson, Clarke, Kern & Childs, 1995; Dunlap, Kern-Dunlap, Clarke & Robbins, 1991; Kern, Bambara & Fogt, 2002; Kern, Childs, Dunlap, Clarke & Falk, 1994). In this area of study, a group of researchers have conducted a series of studies to replicate and extend research methods and findings. The common focus of curriculum modification in these studies is incorporating student's interests and choice makings into curriculum.

Researchers conducting four empirical studies (Clarke et al., 1995; Dunlap et al., 1995; Dunlap et al., 1991; Kern et al., 1994) reported that modified curriculum with incorporated students' personal interests was effective on managing student behavior. In addition to employing effective curriculum modification in these studies, they also used pre-intervention assessments of functional analysis and functional assessment to determine what the student's special needs and interests were to most effectively modify learning outcomes for the students. Based on the analyses, the researchers set up situations in which the students were expected to demonstrate more appropriate behaviors. Classroom teachers, then, implemented modified activities, assignments, instructions, and contents in their classrooms. For example, in the study conducted by Clarke et al., (1995), the focus was on the disruptive behaviors of a participant during

handwriting assignment, which required the student to copy pages from a traditional handwriting book. A comprehensive process of functional assessment was conducted to investigate problem behaviors and the student's interests through observations, interviews with teachers and the student, and direct discussions with the student. As a result, the authors identified Nintendo as the student's preferred leisure activity and substituted a handwriting activity requiring him to copy rules from a Nintendo game booklet for the conventional handwriting assignment. As we can see in this process, a functional analysis and a functional assessment have their advantages in that all information is from actual individual students and lives inside and outside classrooms.

In the four studies reviewed in the following section, functional analysis and functional assessment were used repeatedly. Outcomes from the functional analysis and functional assessment became the foundations of teachers' decisions on designing curriculum modification. In each of these studies, the authors reported that considering student's personal interests played a pivotal role when designing curriculum modification, and simultaneously emphasized that practicing a functional analysis and a functional assessment were effective tools for identifying student interests and designing curriculum modifications. The following paragraphs describe research findings from each of these four studies which used a functional analysis and a functional assessment.

First, Dunlap et al., (1991) found that the behaviors of a student with severe emotional disturbance and multiple disabilities improved when teachers implemented the modified curriculum based on the results from a functional assessment of the participant's behaviors, preferred physical movement, and choices. This case study involved a twelve-year old female student, Jill, with severe emotional disturbance and a range of disabilities including mental retardation and ADD. Based on five weeks of a detailed and comprehensive functional assessment, the researchers and teachers hypothesized some of the optimal conditions in which Jill may demonstrate more appropriate behaviors. These conditions were: learning through more large motor activities and less fine motor and academic requirements, engaging in the activities resulting in concrete and preferred outcomes, and having some choice regarding those activities. In short, the researchers hypothesized that, if the curriculum was based on Jill's interests and if it created concrete outcomes she valued, her behavior would improve. Curriculum was revised and modified based on the guideline reflecting the hypotheses and was implemented during both academic and non-academic activities for a six month period. The authors reported that during the intervention period with the modified curriculum, Jill's disruptive behavior and inappropriate vocalizations decreased, and on task behavior and appropriate social interactions increased. The researchers concluded that functional assessment process and curriculum modification were found to be efficient to reduce Jill's severe behavior problems.

Second, Dunlap et al., (1995) also found that modified curriculum based on the results from individual functional assessment helped students with severe emotional behavioral challenges improve their behaviors, productivity, and task-completion. This short-term case study involved three students aged between 9 and 13 who had severe emotional and behavioral challenges. The researchers and teachers identified the students' interests and determined functional/concrete outcomes through individual functional assessment, including interview, observation, and brief probe. They then designed modified tasks and instructions based on the functional/concrete outcomes reflecting students' interests. For instance, the functional assessment revealed that one of the participants, Jerry, enjoyed sharing snacks with others, and the researchers determined that the functional outcome was an assembly task reflecting his interests. The modified task derived from this functional outcome was for him to engage in a multi-step assembling process of

preparing cracker sandwiches with peanut butter and jelly for himself and his classmates. This modified task substituted to Jerry's previous task of assembling pens.

Overall, the researchers reported results that each student engaged in less problem behavior when they received modified curriculum. Productivity and the rate of task completion increased as well as the students' affect showed a positive change after the intervention. Dunlap et al., (1995) concluded that tasks and activities can be modified through providing different variables, such as materials, response requirements, outcomes, and familiarity. They also emphasized that these variables in students' social contexts and the combinations of such variables play a key role in the process of an effective curriculum modification.

In the third study found, the authors reported similar results as Dunlap et al., (1991) and Dunlap et al., (1995). Clarke et al., (1995) found that curriculum modified to incorporate students' interests were associated with reductions in inappropriate behaviors and an increase in task productivity. Importantly, the researchers used a functional assessment to determine the students' interests and modified tasks. Their study involved four boys with severe emotional and behavioral disturbance and other disabilities, such as autism and ADHD. The data were collected over a 5 week period in the student's specialized classrooms. Based on the results from functional assessment, the researchers provided the students with both standard assignments and interesting assignments incorporating student's personal interests.

There were three dependent variables identified when measuring the effects of modified curriculum: (a) disruptive and desirable behavior, (b) student productivity, and (c) social validity. The researchers collected student behaviors data through classroom observation, tape and video recording using 15 second partial interval system. For students' productivity, the researchers investigated the rate of performance and an amount of task completion within the scheduled session. Questionnaires were used to examine the social validity of modified curriculum and were completed by teachers and students. Clark and colleagues report that modifying curriculum through using functional assessment and incorporating student's interests was effective in reducing student's disruptive behaviors and in promoting task productivity. The questionnaire results also indicated that there was a consistent positive difference among the subjects for the assignment created based on student interests in comparison to the conventional assignment.

The fourth study which used functional assessment was a case study conducted by Kern and his colleagues (1994). The researchers found that functional assessment of a student's behavior, the hypotheses developed through the assessment, and the guideline for curriculum modification reflecting the hypotheses contributed to the effective practice of modified instructions and assignments in English, math, and spelling classes for a student with emotional and behavioral challenges. The student's on-task behavior increased when modified curriculum took place. In this case study, the participant was an eleven-year old boy, Eddie, with emotional and behavioral challenges and unique to this study, above average cognitive and communication skills.

After a comprehensive functional assessment, five curricular variables were identified and hypotheses were developed according to the functional assessments. The researchers hypothesized that Eddie's on-task behavior increases when engaged in activities that do not require excessive amounts of handwriting, problem-solving skills, multiple brief tasks, when reminded to attend to his work, and when provided with the option of working in a study carrel. Based on these hypotheses, the researchers modified curriculum used in Eddie's English, math,

and spelling classes. Curriculum modification included the manipulation of “several curricular variables related to the content, length, and mode used to perform tasks” (p. 17, Kern et al., 1994).

During the 8 weeks of intervention period, Eddie’s on-task behavior was recorded and a self-reported activity rating form. As a result, Eddie’s on-task behavior increased when he received modified curriculum in all academic subjects. In addition, his teacher reported substantial improvements in work completion. Also, Eddie preferred the revised curriculum to standard curriculum. Kern et al., (1994) emphasized that increased individualization, such as incorporating students’ interests in curriculum, contributes to not only the intended goals for an individual student but potentially to other educational goals as well. In Eddie’s case, teachers can expect that the reduction of undesirable behaviors resulted from curriculum modification would positively influence his academic progress.

Similar results to the four studies described above were reported by Kern et al., (2002) without a formal use of functional analysis/assessment. Their study reported that modifying curriculum through incorporating student’s interests into an instruction increased the engagement of students with severe emotional disturbance and decreased their destructive behavior. The subjects of this study were 6, 13 and 14 year old boys. All participants attended a university-affiliated private school for students with severe behavioral challenges.

The purpose of this study was to examine the effectiveness of modified curriculum which provided choice-making opportunities and high-interest activities simultaneously across all students in the class. The modified science curriculum included choice-making, both individual and group choices, and high interest activities. For instance, students were allowed to choose one of two different activities, such as checking air pollution experiment or beginning land pollution experiment. High-interest activities were determined by teachers’ previous teaching experiences with the students and informal assessments. The researchers recorded the change in student’s behaviors in two phases, a baseline phase with traditional science curriculum and an intervention phase with the modified science curriculum. Students’ engagement and classroom behaviors were measured. In addition, the researchers examined students’ opinions about curriculum modification by having students complete class evaluation sheets.

Kern et al., (2002) report that student engagement increased and destructive behavior decreased when they received the modified science curriculum. Also, the ratings of student preference for the lessons employing curricular modifications were slightly higher than baseline condition. The classroom teachers reported overall satisfaction with all aspects of the intervention. The significance of this study are results suggesting curriculum modification at the classroom level resulted in equally positive outcomes as the previous studies at the individual level.

Thus, results of these studies indicate that, with formal or informal assessment of student’s interests and behavioral issues, curriculum modification created flexibility through which teachers may create more appropriate learning contexts for their students with emotional and behavioral challenges. The flexibilities in the modified curriculum evident in these studies incorporated student interests and providing choices. These modifications were found to be effective to improve behavioral issues for students’ with various types of disabilities and cognitive challenges.

One of the limitations of these studies was research design. These studies took place in the special programs designed specifically for the students with emotional and behavioral

challenges, and there were no control groups with which to compare results. Therefore, the generalizability of the results to other educational settings, such as integrated classrooms, is less clear. However, there is also *strength* in their research design. Significantly, the researchers in these studies obtained data not in controlled laboratory settings but in actual classrooms with the participants' teachers. In all studies, teachers implemented modified activities, assignments, instructions, and contents. Of significance as well is that the student interests did not necessarily have to come from school oriented topics but could come from outside school. Overall, these studies contributed to our understanding of the effectiveness of curriculum modification to student's behavior management. There seems to be a strong research trend to replicate and expand currently available research results to further research efforts with different groups of students and different scales of study. Future research in this field is expected to continue following this trend.

Modifications Designed for Inclusion

In this section we present one descriptive report by Salisbury, Mangino, Petrigala, Rainforth, Szyca & Palombaro, (1994) with empirical evidence, regarding the effectiveness of curriculum modification for inclusion (Salisbury et al., 1994). Salisbury and her colleagues found that modifying curriculum based on student's IEP resulted in successful physical, social, and instructional inclusion of students with mild to profound disabilities. This study reported a curriculum adaptation process used for 26 students across kindergarten through grade 4 in a suburban rural, blue collar community in south central New York, but contained the results from only 3 students. These students had various types of disabilities, including learning challenges, Hydrocephaly, a V-P shunt, severe mental retardation and problem behaviors. The researchers investigated how the curriculum modification process could be applied in mathematics, science, and language arts lessons in order to optimize the instructional inclusion of students. Students' physical, social, and instructional inclusion was recorded through staff observation, videotape, and teacher log.

In order to design the modified curriculum, combinations of varying levels of content and objective modifications were selected based on the individual student's needs. The researchers suggested that, in the development of adaptation process, teachers need to be aware of the following 4 ideas: (a) the students' unique differences should be valued, (b) not all students need to be doing the same thing at the same time, (c) team members or teachers contribute uniquely to the planning and implementation of the process, and (d) all students should belong in the age appropriate general education class. They also assert that for successful curriculum modification, team members need to understand students' IEPs, to plan in advance, expand their knowledge of curriculum, and collaborate with one other.

Summary

There are a small number of empirical articles available investigating the effectiveness of curriculum modification to students' inclusion. One of the possible reasons is that many researchers discuss curriculum modification as a part of inclusion strategies. Also, many studies do not identify the strategy use for inclusion clearly as a curriculum modification and were not reviewed for this paper.

The research studies reviewed in this section, Evidence of Effectiveness, showed the potentialities of curriculum modification for various groups of students and teachers. With its flexibilities, curriculum modification seems to be effective in countless ways. Therefore, stating all possible effective areas is beyond the scope of this report. The similarity found among these studies was their emphases on the constructive view of curriculum design with a student-

centered approach. All studies suggested that the process of an effective modification requires the deep analysis and assessment of students' needs and their learning contexts. Students' needs play essential roles in the process of modification. Clear evidence was seen in the approach of functional analysis/assessment. These studies also suggested that important elements for curriculum modification, such as personal interests, may be commonly considered for all students, whereas, others may be specific to certain groups, such as the linguistic and cultural integration for ELLs.

Most importantly, the findings of these studies reported the effectiveness of curriculum modification for various groups of students, including general education students, ELLs, gifted and talented students, and students with a variety of disabilities. These findings suggested the potentialities of curriculum modification for all students. In order for teachers to learn more about the empirical evidence of curriculum modification in the educational settings similar to their own, further research is needed with a wider range of educational contexts.

FACTORS INFLUENCING EFFECTIVENESS

This section describes 4 factors influencing the effectiveness of curriculum modification. These factors are: (a) individual needs, (b) subject specific needs, (c) teacher's roles and school support, and (d) use of technology.

Individual Needs

When teachers modify curriculum, they first need to analyze and assess educational contexts and to determine the method of modification based on individual student needs. In other words, the impetus of curriculum modification derives from individual needs identified in actual educational settings. Although the extent of curriculum modification widens from accommodation to overlapping curricula, the extent does not represent the degree of effectiveness. Some students may benefit from a minor modification rather than from the major changes regardless of student levels of disability or needs. Also, applying curriculum modification for all students may actually have a negative impact on the students who do not need it.

King-Sears (2001) suggested, for example, that teachers can practice curriculum modification when curriculum enhancement alone is not effective. This, however, does not mean that curriculum modification is more ideal for those who need greater supports to access general curriculum. Curriculum enhancement may work better in some situations than curriculum modification and vice versa. It is crucial to determine the way of approaching general curriculum based on our understandings of students' unique needs and educational contexts. King-Sears stated that, for those students who need further modifications, "the design and delivery of [modifications] should be done in a manner that is thoughtful and considerate of individual student needs" (p. 11).

Both formal and informal analysis and assessment of individual needs are useful for teachers to design effective curriculum modification. Learning about specific needs of particular groups of children, in addition to identifying individual needs in actual classroom settings, may also be a good starting point for teachers to plan curriculum modification.

Subject Specific Needs

Other contextual variables, such as the subject of learning, play important roles when determining the modified goals for students. For instance, Cawley & Parmar (1990) suggest that, in the field of mathematics, curriculum modification which benefits students with disabilities

cannot “simply consist of reduction in the quantity of information or the rate of presentation” (p. 518). Instead, they assert that curriculum modification should include curriculum reorganization, which focuses on the conceptual contents and individual relevance of the curriculum including “mathematical reasoning, understanding, and the ability to apply computation in real-life situations” (p. 518-19, Cawley et al., 1990). Thus, the goals of modified curriculum are influenced not only by the particular student’s unique needs but also by the particular way of knowledge-building associated with content area.

Teacher’s Roles and School Support

Teacher involvement may play a key role for successful curriculum modification. Comfort (1990) acknowledged that practicing curriculum modification is a professional task and asserts that teachers should be encouraged to take part in curriculum and instructional decision-making regardless of the pressures of standardized testing movement built around the curriculum standards. Comfort suggests 4 factors fostering curriculum modification: (a) a school system curriculum of appropriate breadth and specificity, (b) the curriculum development and implementation processes that include an integral role for teachers, (c) the expectations for greater collaborative relationship, and (d) the provision of orientations to and encouragement of the practice of curriculum modification.

In order to meet these factors, teachers need an extensive amount of support at the school level, including teacher training and professional development opportunities. MacMackin et al., (1997) point out that many general and special education teachers are interested in meeting the diverse needs of students, but do not know how to make appropriate modifications.

In reality, many teachers tend to make inconsistent and unsystematic use of curriculum modification due to the lack of training and their doubts of ineffectiveness. Some teachers first tend to express doubts about students’ reactions to the modified units but are usually surprised at the positive outcomes (Tieso, 2001). Further efforts are necessary to promote more school-wide support and demonstrate empirical evidence of effective curriculum modification.

Use of technology

Technology contributes to the effectiveness of curriculum modification when used appropriately (Birnbaum, 2001). Birnbaum suggests that the selection and the practice of technology, such as software, computer games, the Internet, multimedia, and hypermedia need to follow the student’s IEP in relation to the general curriculum. Based on the individual students’ needs, teachers can select technologies with the features promoting active learning, experimentation, controlled interactions, and independence. For instance, use of a computer game, *Jumble*, by the Tribune Company, may be appropriate for ELLs or students with reading difficulties since the game provides an opportunity to learn and enforce vocabulary. Thus, when modifying curriculum with technologies, teachers need to remember that the features of technologies have to match individual students’ needs.

Teachers also need to recognize that computer experiences may vary greatly among students. Teachers need to consider what Bray et al., (2004) called digital divide—“the gap between those in society who have access to computer technology and those who do not” (p. 3). Again, obtaining the information of individual students is a key to successfully incorporate technology use into curriculum modification.

Overall, the 4 factors discussed above reflect how successfully teachers utilize their knowledge of individual students, educational contexts and how effectively teachers and students select and

use available resources to meet the students' unique needs. As we see in Comfort's statement, "curriculum modification is firmly grounded in the practical realities of the classroom" (1990, p. 398), the effectiveness of curriculum modification is deeply influenced by many factors existing in actual classrooms.

Applications to General Education Classroom Settings

Curriculum modification consists of potential benefits for not only the students who need special support but also other students who learn in the same learning environment at any age levels. For instance, general education students may benefit from modified curriculum designed for the students with behavioral problems in general classroom settings. Through the increased positive behavior and learning productivity of those students, other students in the same classroom may receive more optimal learning environment and opportunities for mutual understandings and more interactions. In another situation, integrating student's linguistic and cultural needs may provide other students with the opportunity to learn new language and culture and may increase their multicultural awareness and mutual respect. In short, when a particular group of or individual students in a classroom benefit from curriculum modification, there is a great possibility that other students receive benefits as well. The mutual benefit can be planned as a shared goal like in the process of overlapping curricula. Or, such shared learning can naturally occur in our everyday teaching.

It is important for teachers to know that various factors affect the effectiveness of curriculum modification. Teacher's understandings of students' backgrounds, resources and materials, and school support are some of the important factors to consider. Professional development opportunities are especially necessary in order for teachers to improve their skills and knowledge in curriculum modification.

In actual classrooms, modifying curriculum may require teachers to use their creativity and flexibility. For instance, they may need to form small groups for some students during lesson or practice differentiated instruction (For more information, see the literature review of Differentiated Instruction on the CAST website http://www.cast.org/publications/ncac/ncac_diffinstruc.html) as needed. Teachers may also need realistic numbers of adults working in their classrooms and vitality to make extra efforts to modify existing curriculum. Switlick (1997) suggested that curriculum modification becomes successful when it includes FLOW: **F**it into the classroom environment, **L**end themselves to meeting individual student needs, **O**ptimize understanding for each student, and **W**ork well with the activity planned for the lesson.

Curriculum modification can be applied to general classrooms in multiple ways in order to enhance learning potentialities for all students. Only when contextual factors and principles of successful modification are taken into consideration, and the modification is well designed to fulfill individual students' needs determined through extensive analyses and assessment, does curriculum modification play a vital role to move students forward in their learning.

LINKS TO LEARN MORE ABOUT CURRICULUM MODIFICATION

A Process for Making Changes in the General Education Curriculum

<http://intranet.cps.k12.il.us/Lessons/Accommodations/CurrModIntroduction/currmodintroduction.html>

This article is made available by the Chicago Public Schools website and it contains suggestions for potential accommodations and modifications to instruct students with disabilities for general education classroom teachers. Examples are included to help introduce a process that teachers may follow to teach students with disabilities using general education academic standards. The article begins with a brief overview of standards-based instruction and then includes a list of considerations for teachers.

Curriculum for Learning Disabled Students: More Than Just Textbooks and Workbooks

<http://www.nathhan.com/artmore.htm>

The National Challenged Homeschoolers Association Network (NATHAN) supports this website and this article was written by Dr. John Sutton. The article includes a traditional and modern definition of curriculum and argues that commercially produced educational products may not be appropriate for students with learning disabilities. Dr. Sutton provides many suggestions for how to approach selecting educational materials for home schooled children and how to go about employing these materials to teach students with learning disabilities in a home school curriculum.

Curriculum Modifications

<http://www.hoagiesgifted.org/curriculum.htm>

This link provides access to a wealth of information on working with students who are considered “special needs” because they are gifted. The links within this site provide information on the needs of gifted students and how they differ from other children in the classroom as well as suggestions for accommodating these students. Some links provide specific information, others provide the user with source information on a particular topic, and other links provide access to research on the topic. The home site is copyrighted by “Carolyn K,” and the site, called Hoagies’ Gifted Education Page.

Key Attributes of Curriculum Modification

<http://pages.framingham.k12.ma.us/sage/curriculummodification.htm>

This link connects the user to a convenient list, composed by Dr. Deborah E. Bums from the University of Connecticut, of the major elements that need to be considered in curriculum modification. The site provides an “at a glance” reference. The home site is maintained by Deborah Gahres and provides other information on the SAGE program of the Framingham, MA public schools. It is a resource for educators working with students with special needs of *giftedness*.

Margaret Wilson

<http://www.ualberta.ca/~jpdasddc/incl/wilson.htm>

Margaret Wilson, a special education teacher from Longmont, Colorado authored the article found on this web site. The article contains ideas for teachers about curriculum modifications for students with special needs in a multitude of subject areas. In this article, Ms. Wilson answers many questions about supporting students with special needs and behavior management strategies that can be used for students with special needs in the general education classroom.

Modifying the Elementary Curriculum for Students of Special Needs: A List of Ideas

http://www.geocities.com/denisev2/spd_curriculum_modification.html

This web page was written by Jan Demontigny from Farm Hill Elementary School in Middletown, CT. The article is a bullet point list of various curriculum modifications that Mrs. Demontigny has employed in her general education classroom to help students with disabilities. The list includes nine suggestions and an explanation for why they each assist students with disabilities in the general education classroom.

Philosophy of Curriculum Modification

http://barrier-free.arch.gatech.edu/Articles/philos_curric.html

This brief is located on the Barrier Free Education Website created by the produced the [Center for Rehabilitation Technology](#) and the IMAGINE Group at the College of Architecture at Georgia Tech. Barrier Free Education is a resource site devoted to facilitating the access to math and science education for students with disabilities. This particular article provides a philosophy of curriculum modification.

Special Needs Students

<http://www.mth.msu.edu/cmp/TeachingCMP/SpecialNeeds.htm#Mod>

The information found through this link provides teachers with practical and do-able strategies for curriculum modifications. Suggestions are provided for modifications of both assignments and assessments, for students with special needs in a regular education classroom. Although these suggestions are mainly geared toward a mathematics curriculum, they can be carried over into many other subject areas as well. The home site is operated by “Connected Mathematics Project” and provides a wide array of information from curriculum and assessment to research and professional development.

Students With Intellectual Disabilities: A Resource Guide for Teachers

<http://www.bced.gov.bc.ca/specialed/sid/27.htm>

Developed by The Ministry of Education of British Columbia, Canada, this web site is an information resource. The ministry is dedicated to providing a high quality education for children in Kindergarten to Grade 12 so they can develop their individual potential and acquire knowledge, skills and attitudes to contribute to society. This informational piece focuses on curriculum modification and provides six examples of curriculum modifications that teachers may want to employ in their classroom. Additionally, it provides answers to a multitude of questions related to the IEP process and how to transform broad goals into objectives. This is one of several informational articles provided on this web site for teachers and parents.

The ABC's of Curriculum Adaptation

<http://www.pbrookes.com/email/archive/april01/april01ED2.htm>

Brooks Publishers maintains this site and allows limited free access to newsletters and other publications put out by their company. This link brings you to an easy-to-read newsletter entitled “The ABC’s of Curriculum Adaptation.” Suggestions for what needs to be done when planning and implementing an adapted curriculum are clearly outlined. The home page is ©Paul H. Brooks Publishing Co., Inc. but provides links to information on other publications by this company related to the subject you are interested in.

Universal Design and Curriculum Adaptation in Maine

<http://www.maine cite.org/docs/uda.htm>

This website contains information about the implementation of Universal Design (UD) and assistive technology programs in the state of Maine. The Maine Consumer Information Technology and Training Exchange (CITE) Project, ALL Tech, and CAST, Inc. collaborated on an internship /workshop to make assistive and UD technology available in Maine for students with disabilities. The link provides information on the program and implementation in the state of Maine. The authors include a section listing common questions about AT, and provide resources for commonly asked questions. Maine CITE is a statewide project designed to help make assistive and universally designed technology more available to Maine children and adults who have disabilities and maintains this web site.

Inclusion Works! Monroe Everyone Together

<http://home.earthlink.net/~monroeeveryonetgether/>

This site is the homepage of Monroe Everyone Together, a group who supports full inclusion for all students, despite the type or severity of disability. Monroe Everyone Together supplies parent to parent support, information, networking and advocacy training for parents of children with special needs. To get a copy of a Template for a [Curriculum Planning Modification Form](#), click on the “Printable Files” link from the main menu and choose [Curriculum Planning Modification Form](#). This form is a tool for teachers who have students with special needs in their classrooms to help ensure that all students attain the maximum benefits from the instruction.

“What Are Teachers Doing to Accommodate for Special Needs Students in the Classroom?”

<http://www.ed.wright.edu/~prenick/Brendast.htm>

This web site contains an article from the *Electronic Journal for Inclusive Education* written by Brenda Stevens, Caroline Everington, and Stacy Kozar-Kocsis. The authors sought to research these questions (a) if type of disability a student may have affects the frequency of curricular modifications made for the individual, (b) if special education and typical students receive the same amount of curricular modifications, and (c) if there is a relationship between modifications made for special needs students and for average students. This article outlines what the authors did and findings on these topics.

REFERENCES

Birnbaum, B. W. (2001). Using computers to modify the curriculum for students with learning disabilities. *Learning Disabilities: A Multidisciplinary Journal*, 11(1), 19-25.

Birnbaum provides practical ways to modified curriculum using technology. The author identifies five areas to consider when teachers incorporate technology into curriculum for students with learning disabilities. These areas include: (a) criteria for the selection of software, (b) using computer games, (c) the Internet as a tool for teaching across the curriculum, (d) using multimedia, and (e) using hypermedia. A list of Web sites useful across subjects is provided for teachers.

Bray, M., Brown, A. & Green, T. D. (2004). *Technology and the diverse learner: A guide to classroom practice*. Thousand Oaks, CA: Corwin Press, INC.

This book is designed for those who are teaching diverse learners and who want to incorporate technology into instructions. The diverse students on whom this text is focused include female and male students, students with different cultural background, English second language learners, students with disabilities, and gifted and talented students. The authors provide practical ideas of technology solutions for each group of diverse students as well as overviews of each group's characteristics. The appendixes in the end of this book include useful resources of which particular technology and instructional strategies are suitable for a particular group of students.

Buxton, C. (1999). Designing a model-based methodology for science instruction: Lessons from a bilingual classroom. *Bilingual Research Journal*, 23(2&3), 113-143.

The authors of this article present empirical findings from a three-year longitudinal science project, the Science Theatre Project, in which modified science curriculum was provided to elementary aged Spanish-English bilingual children in a two-way bilingual program. The researcher reported that the effectiveness of modified science curriculum to student's academic success. Buxton emphasizes on the consideration of students' cultural backgrounds on the process of modification.

Cawley, J. F. & Parmar, R. S. (1990). Issues in mathematics curriculum for handicapped students. *Academic Therapy*, 25(4), 507-521.

Cawley & Parmar explain the curriculum modification procedure in mathematics necessary for students with handicaps. The authors describe that curriculum modification in mathematics has to include curriculum reorganization, which focuses on the concepts relevant to a specific subject rather than simply on material and the amount of information. Theoretical backgrounds and examples of curriculum reorganization are presented within the framework of the National Council of Teachers of Mathematics (NCTM) standards.

Clarke, S., Dunlap, G., Foster-Johnson, L., Childs, K., Wilson, D., White, R. & Vera, A. (1995). Improving the conduct of students with behavioral disorders by incorporating student interests into curricular activities. *Behavioral Disorders*, 20(4), 221-237.

In the empirical study the authors suggest that curriculum modified with students' personal interests was effective on their behavior management and the increase of task productivity. Functional analysis and functional assessment were used to determine students' interests. Qualitative data obtained through questionnaire demonstrate that students preferred modified curriculum to the conventional curriculum.

Comfort, R. (1990). On the idea of curriculum modification by teachers. *Academic Therapy*, 25(4), 397-405.

Comfort presents a theoretical perspective of curriculum as a teacher-directed modification process and provides suggestions for teachers in terms of their professional responsibilities. Comfort also provides four elements conducive to fostering curriculum modification: (a) a school system curriculum of appropriate breadth and specificity, (b) curriculum development and implementation processes that include an integral role for teachers, (c) expectations for greater collaborative relationship, and (d) provision of orientations to and encouragement of the practice of curriculum modification.

Cummins, J. (2000). Language proficiency in academic contexts: Language, Power, and Pedagogy: Bilingual Children in the Crossfire (pp. 57-85). Toronto, Canada: Multilingual Matters LTD.

Cummins provides the rationale for the distinction between the acquisition of conversational language and that of academic language from multidisciplinary points of view in this chapter. The author describes the distinction using the framework in which students' language proficiency is categorized by the fundamental dimensions of contextual support and cognitive demand. This framework highlights the way in which the educational interventions for ELL students relate to various factors, such as students' language and culture, societal power structure, instruction, and assessment.

Dunlap, G., Foster-Johnson, L., Clarke, S., Kern, L. & Childs, K. (1995). Modifying activities to produce functional outcomes: Effects on the problem behaviors of students with disabilities. *Journal of the Association for Persons with Severe Handicaps*, 20(4), 248-258.

Dunlap et al., in this empirical study suggest that modified curriculum was effective to reduce students' disruptive behaviors and increase their task productivity and completion. Curriculum was modified with students' personal interests determined through a functional assessment.

Dunlap, G., Kern-Dunlap, L., Clarke, S. & Robbins, F. R. (1991). Functional assessment, curricular revision, and severe behavior problems. *Journal of Applied Behavior Analysis*, 24, 287-397.

In this case study, functional assessment was used to determine student's behaviors, preferred physical movement, choices, and curriculum was modified according to the findings of the assessment. Dunlap et al. report findings that functional assessment process and curriculum modification were effective to reduce the student's severe behavior problems.

Fradd, S. H., Lee, O., Sutman, F. X. & Saxton, M. K. (2001). Promoting science literacy with English language learners through instructional materials: A case study. *Bilingual Research Journal*, 25(4), 417-439.

Fradd et al. report the effectiveness of curriculum modification implemented in two large-scale science projects, the Promise Project, and the Science for All Project. Curriculum modification included the incorporation of more open inquiry and the integration of language and literacy aspects into curriculum for English Language Learners. The researchers concluded that modified curriculum was effective to increase the students' academic achievement in science.

Igoa, C. (1995). *The inner world of the immigrant child*. New York: St. Martin's Press, Inc.

This book describes the immigrant children's psychosocial experiences in schools. Igoa uses qualitative research methods and provides rich narratives expressed in children's voices in order to illuminate the issues of being immigrant children in this country. As a teacher who were involved in this participatory action research, Igoa presents three major suggestions to the educators of immigrant children: (a) step-by-step teaching methodologies sensitive to the immigrant children's needs and feelings, (b) specific classroom practices that contribute to the children's literacy development and their self-empowerment, and (c) program designs for more personalized teaching.

Johnson, G. M. (2000). Schoolwide enrichment: Improving the education of students (at risk) at promise. *Teacher Educator*, 27(4), 45-61.

Johnson presents theoretical and practical aspects underlying the Schoolwide Enrichment Model (SEM). The main point of this article is that the SEM can benefit not only gifted and talented students but also students who are identified as at-risk. The process of curriculum modification techniques, as well as curriculum compacting, is explained as a part of the SEM.

Kern, L., Bambara, L. & Fogt, J. (2002). Class-wide curricular modification to improve the behavior of students with emotional or behavioral disorders. *Behavioral Disorders*, 27(4), 317-326.

Kern et al. examined the effectiveness of modified curriculum for six teenage boys with behavioral challenges. Curriculum modification in this study involved more choice-making opportunities and high-interest activities. The authors reported that modified curriculum contributed to the reduction of student's disruptive behaviors and engagement in their academic tasks.

Kern, L., Childs, K. E., Dunlap, G., Clarke, S. & Falk, G. D. (1994). Using assessment-based curricular intervention to improve the classroom behavior of a student with emotional and behavioral challenges. *Journal of Applied Behavior Analysis*, 27, 7-19.

The authors of this case study reported that modified curriculum in English, math, and spelling was an effective way to increase on-task behavior of a child with severe emotional and behavioral challenges. Kern et al. used functional assessment to examine students' behavior and to develop hypotheses for modifying curriculum based on the students' unique needs. Curriculum modification in this study included the change to the content, length, and mode of performance in instructions. This study contributes to the justification of incorporating a functional assessment into a curriculum modification process for children with behavioral issues.

King-Sears, M. E. (2001). Three steps for gaining access to the general education curriculum for learners with disabilities. *Intervention in School and Clinic*, 37(2), 67-76.

King-Sears presents a three-step process for teachers to determine the degree of accessibility of their classroom for their students with disabilities and introduces checklists, examples, and rubrics, and suggestions for strengthening and modifying the curriculum as she categorizes curriculum modification into four: Accommodation, adaptation, parallel curriculum, and overlapping curricula. The three-step process includes: (a) analyzing the general education curriculum, (b) curriculum enhancement, and (c) curriculum modification. The author's emphases are on the importance of teacher collaboration and individually designed curriculum modification. King-Sears' view contributes to the notion of curriculum enhancement and curriculum modification effective for all students.

MacMackin, M. C. & Elaine, M. B. (1997). A change in focus: Teaching diverse learners within an inclusive elementary school classroom. *Equity & Excellence in Education*, 30(1), 32-38.

MacMackin & Elaine suggest that the modifications of curriculum and those of instruction are both necessary to meet diverse needs of students in inclusive classrooms. This article provides the concepts of curriculum modification for many general education teachers who are interested in meeting the diverse needs of students, but do not know how to make appropriate modifications. The authors also describe three categories of curriculum and instructional modification: (a) modifications of the context for learning, (b) modifications of instructional strategies/instructional materials, and (c) modifications of organizational and study skills.

Moon, T. R. & Callahan, C. M. (2001). Curricular modifications, family outreach, and a mentoring program: Impacts on achievement and gifted identification in high-risk primary students. *Journal for Education of the Gifted*, 24(4), 305-321.

Moon & Callahan report the effectiveness of curriculum modification implemented as a part of Project Support to Affirm Rising Talent (START). Modified curriculum, when combined other interventions in the project, was helpful to prevent academic failure among primary grade students from low-socioeconomic environments, especially those who were identified as at-risk.

Olenchak, F. R. (1990). School change through gifted education: Effects on elementary students' attitudes toward learning. *Journal for Education of the Gifted*, 14(3), 66-78.

In this empirical study by Olenchak, the author shows that curriculum modification implemented through the Schoolwide Enrichment Model had a positive impact on students' attitudes toward learning. The subjects involved a large population of middle school students. Olenchak emphasizes the effectiveness of the SEM for all students and suggests that our preconceptions of gifted education as a limited educational opportunity for only selected students, need to be changed.

Olenchak, F. R. & Renzulli, J. S. (1989). The effectiveness of the schoolwide enrichment model on selected aspects of elementary school change. *Gifted Child Quarterly*, 33(1), 36-46.

The researchers of this empirical study illustrate that a one-year implementation of the Schoolwide Enrichment Model (SEM) was effective for a large number of elementary school students, not only gifted and talented students but also general education students, on their creative productivity and attitudes toward overall learning and the concept of gifted education. As a part of the model, curriculum compacting was used.

Reis, S. M., Westberg, K. L., Kulikowich, J. M. & Purcell, J. H. (1998). Curriculum compacting and achievement test scores: What does the research say? *Gifted Child Quarterly*, 42(2), 123-129.

The authors of this empirical study examined the effectiveness of curriculum compacting on the achievement test scores of gifted and talented students. Curriculum compacting was used as an enrichment and involved eliminating about a half of already learned curricula. The results reported indicate that students who received compacted curriculum performed as well as those who received regular curriculum without any elimination. The findings of this study help reduce teachers' fear to compact curriculum for gifted and talented students.

Reisberg, L. (1990). Curriculum evaluation and modification: An effective teaching perspective. *Intervention in School and Clinic, 26*(2), 99-105.

Reisberg presents a format for curriculum evaluation based on the literature on effective teaching for students with disabilities, including the ideas suggested by Englert, Rieth & Everson & Rosenshine. Reisberg's format includes six domains: (a) scope and sequence, (b) organization, (c) presentation, (d) guided practice, (e) independent practice, and (f) periodic review. Rosenshine posits that the curriculum evaluation should reflect the components of effective teaching, such as the completeness and organization of the curriculum, response requirements, and opportunities and procedures for measurement.

Salisbury, C. L., Mangino, M., Petrigala, M., Rainforth, B., Syryca, S. & Palombaro, M. M. (1994). Promoting the instructional inclusion of young children with disabilities in the primary grades. *Journal of Early Intervention, 18*(3), 311-322.

Salisbury describes how curriculum adaptation successfully promoted physical, social, and instructional inclusion of elementary age students with mild to severe disabilities. Curriculum adaptation involved the change to the contents and objectives of curriculum based on students' IEPs. Four suggestions for successful curriculum adaptation process for inclusion are recommended by the author.

Sparks, S. (2000). Classroom and curriculum accommodations for Native American students. *Intervention in school and clinic, 35*(5), 259-263.

Sparks suggests a culture-specific approach to curriculum accommodations for culturally diverse students, especially Native American students, and provides theoretical ideas to practice this approach. Some ideas include: learning about a student's life, including specific tribe culture and individual family lives; building the curriculum on the positive images of students' culture not on negative stereotypes; using effective ways of communication; developing cultural sensitivity; learning about the characteristics of Native American learners.

Switlick, D. M. (1997). Curriculum modifications and adaptations. In D.F. Bradley & M.E. King-Sears & D.M. Switlick (Eds.), *Teaching students in inclusive settings* (pp. 225-239). Needham Heights, MA: Allyn & Bacon.

The authors of this chapter describe methods to modify the curriculum and daily instructional activities for teachers to meet the diverse needs of students. The types of modification include accommodation, adaptation, parallel instruction, and overlapping instruction. The author recommends teachers make systematic adjustments to curriculum and presents useful tables describing the planning processes, including preplanning, interactive planning, and post-planning.

Tieso, C. (2001). Curriculum: Broad brushstrokes or paint-by-the numbers? *Teacher Educator, 36*(3), 199-213.

In this qualitative study focusing on general education students Tieso demonstrated that modified math curriculum was positively perceived by a teacher and students. The author interprets the positive perspectives as a necessary element for students' academic achievement.

Valdes, G. (2002). *Expanding definitions of giftedness*. Mahwah, NJ: Lawrence Erlbaum Associations.

In this book, Valdez describes the way in which immigrant children engage in interpreting tasks for their families. Valdes presents the empirical findings suggesting that children who interpret show sophisticated levels of meta-linguistic abilities as well as bilingual proficiency and social maturity. Based on the findings, Valdes challenges the existing definitions of gifted and talented and a monolingual biased view of bilingual children in educational settings.