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## Curricular and instructional adaptations for special needs students in the general education setting

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## Curricular and instructional adaptations for special needs students in the general education setting

### Abstract

The primary focus of this article is to address when regular education teachers should make adaptations for students in the general education setting and to determine the kinds of adaptations that general education teachers can make for their students. This article also links curricular and instructional adaptations to the research on effective schools. Steps for setting up an inclusive science classroom are presented. Various adaptations in the science classroom are discussed. The findings of this research report indicate that there are a variety of instances where it is appropriate for teachers to make adaptations for students in the general education setting. There are processes that teachers can implement to help determine when these adaptations should be made, as well as a menu of adaptation types from which teachers can choose.

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Needs Students in the General Education Setting

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The primary focus of this article is to address when regular education teachers should make adaptations for students in the general education setting and to determine the kinds of adaptations that general education teachers can make for their students. This article also links curricular and instructional adaptations to the research on effective schools. Steps for setting up an inclusive science classroom are presented. Various adaptations in the science classroom are discussed. The findings of this research report indicate that there are a variety of instances where it is appropriate for teachers to make adaptations for students in the general education setting. There are processes that teachers can implement to help determine when these adaptations should be made, as well as a menu of adaptation types from which teachers can choose.

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## Article Overview

Elementary educators teach students with diverse learning needs. Many special education students are included in general education settings now more than ever before. This often presents a challenge for teachers as they strive to create adaptations to meet the learning needs of all students. The research presented in this article may benefit teachers as they design and implement curricular and instructional adaptations.

This article addresses four questions in adapting curriculum and instruction for students with diverse learning needs. The first question is: When do elementary general educators need to make adaptations for students? The second question is: What types of adaptations do these teachers need to implement to meet the needs of diverse learners in the general education setting? The third question is: What does the effective schools research say about curricular and instructional adaptations? The final question addressed is: What specific adaptations can be made for students in an inclusive science classroom? The following sources were used to investigate these four questions: (a) a computerized database search of ERIC, (b) a manual search of *Teaching Exceptional Children*, *Remedial and Special Education*, and *The Journal of Special Education*, (c) an examination of the bibliographies and reference lists from the review articles retrieved by the computer and manual searches.

This paper may be used as a framework for the development of a workshop for teachers. The workshop will address when teachers should make adaptations, and the types of adaptations they should make for students. Scott,

Vitale, and Masten (1998) suggest that teachers need staff development training and support from administration and special education to implement adaptations for students.

#### Reference

Scott, B. J., Vitale, M. R., & Masten, W. G. (1998). Implementing instructional adaptations for students with disabilities in inclusive classrooms. Remedial and Special Education, 19 (2), 106-119.



## CURRICULAR AND INSTRUCTIONAL ADAPTATIONS FOR SPECIAL NEEDS STUDENTS IN THE GENERAL EDUCATION SETTING

### When Do Adaptations Need to be Made?

Students in our schools are educated in inclusive settings now more than ever before. With the reauthorization of the Individuals with Disabilities Education Act (IDEA) in 1997, many general educators now need to make adaptations for students with special learning needs in the general education setting. General and special educators must work collaboratively to design adaptations for special education students. Teachers also need to make adaptations for students who are at risk or who have diverse learning needs. These students may not be served in a special education program, yet teachers are faced with making adaptations for these students, as well as for students who are identified as special education students. Effective schools create instruction that meets the individual needs of all students, including those with special needs (Weber, 1971).

Teachers in the general education setting are expected to implement both curricular and instructional adaptations in an effort to meet the needs of diverse learners. Two definitions of adaptations are addressed in this article. Curricular adaptations are defined as: any adjustments or modifications in learning expectations, curriculum, content, the environment, instruction, or materials used for learning that enhance a person's performance or allows at least partial participation in an activity (Baumgart et al., 1982 ; Udvari-Solner, 1992). Deschenes, Ebling, and Sprague (1994) define instructional adaptations as: "The practice of

changing the manner in which instruction is delivered in order to meet the needs of individual students including grouping strategies, formats for evaluation, and methods of presenting lessons ” (p. 7).

Adapting instruction and curriculum is one component of inclusive schools. The research on effective schools can be linked to making curricular and instructional adaptations for students. Mauer (1996) states:

An effective inclusive school is a diverse, problem-solving organization with a common mission that emphasizes learning for all students. It employs and supports teachers and other staff members who are committed to working together to create and maintain a climate conducive to learning. The responsibility for all students is shared. An effective inclusive school acknowledges that such a commitment requires administrative leadership, ongoing technical assistance, and long-term professional development. (p.1)

The research on effective schools has generated a list of correlates that exist in these schools. Salivone and Rauhauser (1988) cite the following correlates of effective schools:

- Clear school mission
- Instructional leadership
- Safe and orderly environment
- High expectations
- Home-school relations
- Monitoring of student progress
- Opportunity to learn and time on learning

Effective schools meet the needs of all learners, including those learners with special needs. Implementing curricular and instructional adaptations is one

way that teachers can meet the individual learning needs of all students. Stellar (1988) indicates that in an effective school, a climate exists where **all** children can learn. Providing adaptations is valid way for teachers to effectively reach all students. Squires, Huitt, and Segars (1983) state:

Our review of the research on effective classrooms indicates that teachers can have an impact on student behaviors and student achievement. And teachers do that by planning, managing, and instructing in ways that keep students involved and successfully covering appropriate content. (p. 15)

Teachers often need to make curricular and instructional adaptations in their efforts to keep students actively engaged in content rich and meaningful lessons. School improvement endeavors which center around the effective schools research are based on the notion that all students, including those with special needs, can learn (National Council on Disability Report, 1989). General education teachers need to know when to make adaptations in curriculum and instruction in order to meet the needs of diverse learners in inclusive settings.

There are many instances where it is appropriate and necessary for teachers to make curricular and instructional adaptations for students. When teachers are making decisions regarding instruction, the effective school correlate of high expectations for all students should be remembered. This includes having high expectations for students with disabilities (Scruggs, Mastropieri, & Sullivan, 1994). It is suitable to adapt content objectives and instructional delivery methods when a student is not successful in the general education setting (Deschenes et al., 1994). Adaptations are often needed if special education students are to receive appropriate instruction in the content areas. Stainback, Stainback, and Stefanich (1996 ) report that learning core

subjects such as social studies, science, and math with peers is beneficial in the long term for students with disabilities, including those with severe disabilities.

When the course content is relevant and meaningful to students with disabilities, curricular and instructional adaptations should be made to facilitate learning. Effective classroom teachers provide opportunities for all students to participate in a wide variety of content-related lessons (Stellar, 1988). In inclusive settings instruction can be adapted to ensure the academic success of all students (Smith, Polloway, Patton, & Dowdy, 1998). In content areas, such as science, a match needs to exist between the student's abilities and learning style and the curriculum and instructional methodologies. Stainback et al. (1996) state: "Some students exhibit *learned helplessness* when there is not a good match between learning objectives and student attributes" (p. 14). In these cases it is important for that match to exist, and making adaptations for students is one way to create that match. Salisbury et al. (1994) state:

The reality of today's society is that each child, on any given day, can be a child with special needs. It is therefore important that schools tailor curriculum and instructional practices to fit the diversity of students' needs and abilities represented in their classrooms. Adapting the "standard" to fit those who may not fall within expected margins is a necessary strategy for effective teaching and learning, one that enhances the likelihood that all children will feel like they belong and feel successful. (p. 311)

Clearly then, adaptations can enhance student success in the content areas.

Some research has generated questions about serving mildly disabled students via pull-out programs because of the limited growth of this category of students (Epps & Tindall, 1987 ; Idol-Maestas, 1983 ; Leinhardt, Bickle, &

Pallay, 1982; Polloway, 1984 ). If pull-out programs are not effective, providing adaptations within the general education classroom may prove to be more effective (Baker & Zigmond, 1990). Current research on effective schools and effective classroom practices should help facilitate the integration of special education students into general education classes (National Council on Disability Report, 1989). As special education students are more fully included in general education classes, teachers will be required to determine when adaptations are warranted to meet individual student's learning needs.

When teachers adapt the structure of student programs as a result of individual assessment data, students learn significantly more (Fuchs, Fuchs, Hamlett, & Ferguson, 1992). When making adaptations, the needs of the student should drive the process, not the label of the student or the specific curriculum standard (Cousin & Duncan, 1997). There is such a great difference in students' learning styles and needs, that teachers must carefully examine the instructional requirements of individual students and the variance of instructional methodologies when designing lesson adaptations (Mercer, Lane, Jordan, Allsopp, & Eisele, 1996). When teachers make adaptations in curriculum and instruction, the Individual Education Plan (IEP) of the student should be used as a framework and a reference (Golomb & Hammeken, 1996). Special and general educators can work collaboratively on this. General educators teach students with a wide variety of abilities and backgrounds in inclusive settings. Special education students are often included for content area instruction. In order for these students to achieve success, teachers must be willing to adapt both instructional methods and curriculum (Schumm & Vaughn, 1991). Teachers in effective elementary schools regularly adapt curriculum and instructional techniques to meet the diverse learning needs of

their students (Levine & Lezotte, 1990).

There is research that documents when adaptations are used most successfully in meeting the needs of students with special needs. Myles and Simpson (1989) found that adaptations are most successful when general education teachers are involved in making decisions about designing and implementing the adaptations for students with disabilities. If teachers are given structures and supports for implementing adaptations, they will use them effectively in the general education classroom (Fuchs, Fuchs, Hamlett, Phillips, & Karns, 1995). Classroom teachers require a support system to implement various types of adaptations. Scott, Vitale, and Masten (1998) reported that when these support systems are in place, teachers will make the necessary adaptations for students. Staff development courses are one way that teachers can feel supported in their effort to design effective adaptations for students. Instructional leadership is needed to secure staff development opportunities for teachers to learn about effective teaching practices, such as making adaptations for students with special needs. The need for instructional leadership can be linked with the research on effective schools (Salivone & Rauhauser, 1988). General education teachers require instructional leadership from both administrators and special educators when designing adaptations for students.

Udvari-Solner (1996) found that when teachers decide what adaptations need to be implemented, they engage in a personal, reflective dialog with self-questioning. This leads to these same questions being posed when they meet in a group setting with other educators and parents. The National Council on Disability (1989) reported that parents desire the opportunity to work collaboratively with teachers when determining appropriate adaptations for their

children. This collaboration can foster positive relations between home and school, one of the effective school correlates, as indicated by Salivone and Rauhauser (1988). Udvari-Solner (1996) stated: " Using questions as a heuristic structure best depicts the personal scrutiny and internal dialog engaged in by teachers. A question-oriented approach also promotes joint inquiry, which in turn invites dialog among team members " (p. 247). Udvari-Solner (1996) suggested that when teachers use this process of asking questions as a structure to determine when adaptations should be made, it produced the framework for best changing how lessons are developed, structured, and implemented. These questions are summarized below :

1. Can the student actively participate in the lesson without any adaptations and achieve the same outcome?
2. Will student-specific learning objectives need to be written?
3. Can the student's participation level increase by altering the modality of instruction?
4. Can the student's participation level be increased by altering the structure of the lesson?
5. Can the student's participation and comprehension be increased by altering the instructional methods or teaching styles?
6. Can the physical environment be altered to help facilitate participation?
7. Will the student need individual help to ensure participation?
8. Will an alternative activity need to be implemented?

Following a set of questions, such as those listed above, can assist teachers in determining when to make adaptations for students.

Teachers may choose to implement a more structured process when

determining whether adaptations are necessary for student success. Winter (1997) developed a process for implementing adaptations entitled SMART. SMART is an acronym for Select, Match, Adapt, Relevant, and Test. This is intended to suggest the five central planning elements when determining what adaptations are needed. These five elements can be used in isolation or together when determining the adaptations that may be necessary for students. In this process, teachers are to compare curricular content with student learning styles and capabilities and then make appropriate selections. The selection of curriculum and instructional approaches should be flexible and create a setting that is suitable for various learning styles and capabilities. Another element in this approach of Winter's process is that of matching the student's educational opportunities with the student's strengths, not his or her weaknesses. Another component of the SMART structure asks teachers to determine any appropriate adaptations for the student. The goal is for teachers to focus on a student's capabilities instead of his or her disabilities when making adaptations (Deschenes et al. 1994). The final element Winter's process is testing. Teachers need to develop testing measures that test the whole child and not isolated skills and concepts. When making adaptations for testing tools, teachers can implement alternative assessment techniques. Such assessments are tailored for students who may need to document progress over time (Winter, 1997).

Following a structured process such as SMART could be beneficial for teachers who are determining when to make adaptations for students in the general education setting. When teachers determine if adaptations should be made, the goals of adaptations need to be considered. Curriculum adaptations should achieve two main goals: to promote positive student outcomes and optimize the physical, social, and instructional inclusion of the student in



ongoing classroom lessons and activities (Salisbury et al., 1994).

### What Types of Adaptations Can Teachers Make?

There are many types of adaptations that can be implemented in the general education setting. A key element that influences the type of adaptations that general education teachers use is the method in which they evaluate students' knowledge base and prior experiential learning (Schumm & Vaughn, 1991). General education teachers tend to implement routine adaptations such as varying materials or adjusting groups (Fuchs et al., 1995). In two effective schools in Pittsburgh, Sizemore, Brossard, and Harrigan (1983) found that teachers actively made adaptations in printed materials such as basal readers and their corresponding assessments. Adaptations made in the regular education setting often include four main categories: time, learning styles and instructional delivery, environment, and adjustments in content (Murphy, Meyers, Oelson, McKean, & Custer, 1995). Teachers in effective schools, where students consistently achieve, adapt instruction to meet students' individual needs (Spartz, 1977).

There are many different ways to make instructional adaptations. Yessledyke and Algozzine (1990) found that one way teachers adapt instruction is to use specific strategies such as peer tutoring, cooperative learning, behavior management systems, and technology. Class wide peer tutoring provides each student with chances to work at his or her own instructional level, work as a tutor and tutee, communicate with students with various skill and ability levels, and be engaged in arrangements that center around a collective performance (Delquadrie, Greenwood, Stretton, & Hall, 1983). Another

instructional adaptation is the use of advanced organizers. In a study of teachers, King-Sears and Cummons (1996) found that when the teachers used advanced organizers at the beginning of the day and at the beginning of lessons to show the sequence and flow of content, students with learning disabilities had fewer questions than when the organizers were not used. The organizers were on the board and often had picture icons to correspond with the text. The use of specific adaptations can be especially beneficial for students with disabilities.

Curricular adaptations are often varied according to the content and grade level expectations. Booth and Ainscow (1998) suggest that one type of curricular adaptation is allowing students to participate in setting their own learning and social objectives combined with the teachers' objectives in the same areas. The students can then evaluate their progress on their goals as well as the teacher's goals. However, Stainback et al. (1996) suggest that writing separate or varying learning outcomes for one student or small groups of students can foster a sense of isolation and separateness in the general education setting. Curricular adaptations can be designed for groups of students, as well as for individual students.

There are eight types of adaptations in the research by Scott et al. (1998). These adaptations are summarized below:

1. Modifying instruction. This includes classroom demonstrations, adjusting lesson pace, and multiple instructional modalities.
2. Modifying assignments. This includes providing models, shortening assignments, and lowering difficulty levels.
3. Teaching learning strategies. This includes teaching study skills, test-taking skills, and learning strategies.

4. Altering instructional materials. This includes providing alternate materials, taping books, and reformatting worksheets.
5. Varying instructional grouping. This includes peer tutoring and cooperative groups.
6. Enhancing behavior. This includes praise, behavior contracts, and token economies.
7. Altering curriculum. This includes lowering difficulty of the content.
8. Facilitating progress monitoring. This includes reading tests orally, providing study guides, retaking tests, and modifying grading criteria.

Teachers in effective inclusive classrooms may use one or a combination of several of these adaptation types to meet the needs of diverse learners in the content areas.

There are numerous adaptation types teachers can use to increase student learning and participation in inclusive settings. Deschenes et al. (1994) provide a model that includes nine types of adaptations. These types of adaptations are summarized below:

1. Size: Adapt the amount of items that the student is expected to complete.
2. Time: Adapt the time allowed for learning, task completion or assessment.
3. Level of Support: Increase the amount of individualized assistance for the student.
4. Input: Adapt the method of instructional delivery.
5. Difficulty: Adapt the problem or skill levels, or the rules on how the student can do the work.
6. Output: Adapt how the student can respond to the instruction.

7. Participation: Adapt the level to which the student is involved in the task.
8. Alternate goals: Adapt the goals or objectives, while using the same materials.
9. Substitute Curriculum: Provide different instruction and materials to meet the student's individual goals.

Classroom teachers should choose adaptations that allow students to remain actively engaged and participating in the lesson and any corresponding activities whenever possible.

General education teachers implement a wide variety of adaptations in an effort to meet student needs. However, teachers do not always find that all types of adaptations are as readily implemented as others. Adaptations that were rated most feasible in a study by Johnson and Pugach (1990) were those centered around using positive methods and multi-sensory techniques which were readily integrated into daily classroom routines. Adaptations that were less favorably rated involved dealing with students individually. Yesseldyke, Thurlow, Wotruba, and Nania (1990) found that teachers rated identifying alternate ways to manage student behavior, implementing alternative instructional methodologies, using a variety of instructional materials, and using alternative grouping practices as desirable classroom adaptations.

Teachers use typical adaptations more frequently than substantial adaptations. Typical adaptations include altering the format of directions, assignments or testing procedures. Substantial adaptations include changing the difficulty level for students, such as: implementing altered objectives, assigning less complex work, and providing texts with lower readability levels (Munson, 1986). This research suggests that while there are a wide variety of

adaptation types, teachers will implement the types of adaptations with which they are comfortable and the types of adaptations they understand. Teachers in effective schools feel that they have the instructional freedom to alter instruction and assignments to meet the individual needs of their students (Jackson, Logsdon, & Taylor, 1983). When teachers understand typical and substantial adaptations and believe that they have the freedom to make such adaptations, students in inclusive settings benefit.

### Teacher Attributes in Effective Schools

There are numerous characteristics of effective schools. Stefanich (1983) indicated that some of these characteristics are directly related to the classroom teacher. These characteristics can also be linked to teachers who effectively adapt curriculum and instruction to meet the diverse learning needs of students in inclusive settings. Teachers in inclusive classrooms strive to create a sense of community and belonging. Creating this type of an environment is an essential element of effective schools (Salivone & Rauhauser, 1988).

In an effort to create an effective classroom, where adaptations are made for students, teachers need to exhibit the attributes of teachers in effective schools. These attributes, as summarized by Stefanich (1983) , are listed below:

- Maintain a clear focus on academic goals
- Select instructional goals
- Perceive the students as able learners
- Implement an evaluation system based on individual student learning, rather than on a comparison with other students' achievements
- Accurately diagnose student learning needs to foster high student

achievement

- Prepare lessons (including adaptations) in advance
- Meet students' needs in both academic achievement and socialization
- Are readily available to consult with students about issues and problems
- Attend staff development courses to continue their professional development
- Keep parents informed and involved

Teachers who regularly adapt and modify curriculum and instruction exhibit these characteristics of teachers in effective schools.

### Creating an Inclusive Science Classroom

Educators can successfully adapt curriculum and instruction in all subject areas. Science is no exception. General education teachers can adapt instruction and curriculum to meet a variety of student needs in the science classroom. However, due to the limited science background of many elementary general educators, adapting curriculum in this content area can present special challenges. According to Scruggs and Mastropieri (1994) classroom teachers can successfully include students with disabilities in science when the following are present :

- Administrative support
- Support from special educators
- Accepting classroom atmosphere
- Effective teaching skills
- Student to student peer assistance

- Disability-specific teaching skills

Science is a subject that is conducive to inclusion, as it has curriculum and instruction that is not often readily accessible to special education teachers. Adapting science curriculum and instruction provides special needs students with rich experiences that they may not receive in other more traditional settings.

Teaching science in an inclusive setting is one way for students with special needs to receive quality science instruction. Special education students often miss science instruction when they are pulled out to receive special education services. When these students do receive science instruction, it is from special educators who have little, if any, training in science instruction (Gurganus, Janas, & Schmitt, 1995). When special needs students are included for science instruction, the most commonly used approach is the content approach (Scruggs & Mastropieri, 1993). In this approach, textbooks are the primary source of curriculum and instruction. A contrasting approach is the activity-oriented approach. In this approach, the teacher may still employ direct instruction, however, students are being actively engaged in the exploration of science concepts (Scruggs & Mastropieri, 1993). In this approach, the use of the textbook and the need for acquisition of new vocabulary is significantly decreased. In the activity-oriented approach, students apply the processes of science: observation, classification, measurement, comparison, predictions, and making inferences. Activity-oriented approaches to science that address fewer topics, but where the topics covered are done so in depth, can be especially beneficial for students with special needs (Patton, 1995). Both content and activity-oriented approaches can be adapted and modified to meet the diverse learning needs of students.

Teachers want all students to be successful in their science classroom. This success can also be achieved in an inclusive science classroom. When creating an inclusive science classroom, Patton (1995) suggests the following guiding principles:

- Science lessons should be hands-on
- Teachers should be facilitators of knowledge, rather than dispensers of knowledge
- Cooperative groups should be implemented
- Teachers need to make curricular and instructional adaptations
- Utilize theme-based instruction
- Capitalize on “teachable” moments
- Encourage students to think

When teachers apply these principles, create an atmosphere where all students belong, and engage in quality teaching techniques, students will be successful in inclusive science settings. Like Patton, other researchers have strategies for creating a successful inclusive science setting. Mastropieri and Scruggs (1995) suggest the following four strategies for creating inclusive science classrooms:

1. Choose appropriate curriculum. Usually activity-oriented science materials are more conducive to inclusive science classrooms. They use far less vocabulary, less independent reading, less paper-pencil work, and allocate more time for manipulation of examples of the concepts being taught.
2. Use effective instructional strategies. Teachers can implement the effective teaching strategies known as “SCREAM”. This is an acronym for structure, clarity, redundancy, enthusiasm, appropriate pace, and maximized engagement. Teachers can also use strategies such as



cooperative groups, mnemonics (for vocabulary acquisition), and student self-monitoring to create an inclusive science environment.

3. Adapt specific science activities. When choosing activities and lessons teachers must evaluate them in relationship to the students in their class. Providing adapted materials, lesson delivery, and activities are necessary when creating an atmosphere where all children can learn, participate and feel a sense of belonging.

4. Use effective assessment strategies. Implementing performance assessment instead of paper-pencil tests often provides a more viable option for students with disabilities. Performance-based assessment can be directly linked to the scientific processes. This type of assessment allows students to demonstrate the skills and knowledge they have acquired during instruction.

Creating an inclusive science classroom is a balance of designing an accepting environment, implementing effective instruction techniques, and adapting curriculum, materials, and instruction. Inclusive science classrooms are important for students. Patton (1995) states:

As professionals interested in preparing students for the challenges of adulthood, we must ensure that **all** students - both with and without special needs- receive meaningful and relevant science education. If science is important in many aspects of our lives, then science education must cover the topics that have a significant impact on our personal, family, workplace and community needs. (p.4)

Designing and implementing inclusive science classrooms is a worthwhile and attainable goal for elementary educators as we embark on our journey into the twenty-first century.

## Adaptations in the Science Classroom

When special needs students are included in general education settings, adaptations often need to be made to meet individual student needs. The inclusive science classroom is no exception. Patton (1995) and Mastropieri and Scruggs (1995) indicate that one of the steps in creating an inclusive science classroom is the need to make adaptations to curriculum, instruction and materials. One major adaptation that can be implemented to achieve a successful inclusive science setting, according to Mastropieri and Scruggs (1992), is to shift to an activity-oriented science program from a content-centered curriculum. The use of an activity-oriented science curriculum is beneficial for students with special needs (Mastropieri & Scruggs, 1992). However, this is not always an alternative. Content-centered approaches can also be adapted to meet students' individual learning needs. Adaptations for both approaches are key to the success of inclusive science classrooms.

Designing and implementing curricular and instructional adaptations in the science classroom are similar to those in other content areas. Science adaptations can sometimes pose special challenges due to the nature of experiments and the materials used. Teachers must plan lesson adaptations in advance and anticipate difficulties that students may encounter with the materials needed or the activity in which students are to be engaged. Scruggs and Mastropieri (1992) recommend the following adaptations for the inclusive science classroom:

1. Vocabulary: Simplify language, preteach vocabulary, use mnemonics, use picture clues, implement peer tutoring, and evaluate which

vocabulary is essential

2. Instructional Delivery: Modify rate and how material is presented, include visual organizers, present concrete examples, preteach prerequisite information, provide additional application activities, use a variety of instructional strategies, provide advanced organizers, use cooperative learning groups, integrate other content areas into science, shorten lessons, and provide structure

3. Text: Provide graphic organizers and framed outlines, highlight important vocabulary and key concepts, implement partner reading, provide tape recorded readings of text selections, and use trade books at various reading levels

4. Materials: Provide multi-textured materials, concrete models, materials that are easily manipulated and large enough for small hands, materials that can be taken apart and reassembled, manipulatives for linear measurement, and materials that can be felt or heard when solutions are stirred or shaken

5. Assessment: Provide authentic and performance-based assessment that can be easily linked to scientific processes, allow for multiple opportunities to demonstrate acquired knowledge and skills, implement portfolio assessment, teach test-taking skills and study techniques

Adapting science instruction to meet the needs of special education students is not always an easy task. It does, however, provide students with the opportunity to experience science in a content-rich environment. When teachers make adaptations in curriculum, instruction, and materials in the inclusive science classroom, students with special needs can interact with their peers

and receive quality science instruction. Utilizing the adaptations outlined by Scruggs and Mastropieri (1992) may not only benefit students with special needs, but may also enhance instruction for all students in the science classroom.

### Summary and Conclusion

The purpose of this article was to address when general education teachers should make adaptations for students, the different types of adaptations teachers can use in their classrooms, to link the effective schools research with curricular and instructional adaptations, and provide specific adaptations for the inclusive science classroom. Situations were discussed in which teachers should make adaptations for their students. Processes by Udvari-Solner (1996) and Winter (1997) were explained to document how teachers can determine when adaptations are necessary to ensure student success. Various types of adaptations were discussed. Models of specific adaptations by Deschenes et al. (1994) and Scott et al. (1998) were presented. Adaptations for use in the science classroom and steps for setting up an inclusive science classroom were presented.

Teachers need to make adaptations when students are not successfully meeting the demands of the general education setting. Teachers must make adaptations when the learning style or skills of a student do not match the instructional delivery or content objectives (Stainback et al., 1996). When pull-out programs are not meeting the needs of the students, teachers should make carefully designed adaptations in the general education setting. Teachers can ask themselves a series of questions to determine when adaptations should be

made (Udvari-Solner, 1996). Educators may choose to implement portions or all of a process similar to SMART, in order to determine when adaptations should be made (Winter, 1997).

There are numerous adaptation types that teachers can implement to help ensure the success of their students. Consulting a list of adaptation types, such as those from Deschenes et al. (1994) or Scott et al. (1998), can be helpful when teachers determine what types of adaptations are appropriate. When teachers feel that the types of adaptations are feasible and desirable, they will use them (Johnson & Puchgach 1990; Yesseldyke et al., 1990). Teachers in effective schools exhibit a willingness to make adaptations in assignments and instructional delivery to meet the individual learning needs of their students (Weber, 1971). Students with special needs can benefit when adaptations are made in the science classroom. Inclusive science classrooms provide rich learning environments for all students. Inclusive classrooms of all kinds provide teachers with the opportunity to design and implement both curricular and instructional adaptations. These adaptations can positively impact student learning. In inclusive settings, where adaptations are made, all children can learn, feel a sense of belonging, and achieve their educational and social goals.

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