A wide range of strategies and approaches is available to support the teaching and learning process for students with ASD. Integrating a variety of approaches leads to the development of programs that promote the best outcomes for students.

IN THIS CHAPTER

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The National Research Council (2001) found that no one specific method or intervention is effective for all individuals with ASD and that integrating a variety of approaches leads to the development of programs that promote the best outcomes for students.

**Differentiated Instruction**

As recommended in *Education for All* (Ontario Ministry of Education, 2005a), teachers can effectively respond to a learner’s needs and strengths through the use of differentiated instruction. Through this approach, the specific skills or difficulties of students with ASD can be addressed by employing a variety of methods to differentiate (or vary) the following:

**The content:** The depth or breadth of the information or skills to be taught.

**The processes:** The instructional approaches used with the student, as well as the materials used to deliver or illustrate the content.

**The products of the learning situation:** What the end product will be or look like. This product may be tangible (a worksheet, project, composition), a skill that has been acquired, or knowledge that has been gained.

To determine the most effective strategies for students in a learning situation, it is necessary to consider the learning goals for the student in the context of the following questions:

- **What** do we want the student to learn? What essential skills or understandings do we want the student to acquire?
- **Why** is the student learning this? How does the learning goal fit into the goals outlined in the IEP for the student?
- **How** will the student best learn this? What type of activities, materials, and supports are appropriate and effective for the student? How will the student demonstrate learning?
To differentiate instruction, teachers should consider adaptations to the curriculum, instruction, or expectations that may be required according to a student’s readiness, interests, and learning profile.

### Differentiated Instruction

#### Elements that can be varied to differentiate learning activities

**Student groupings**
- Establish multiple or similar ability grouping.
- Divide groups according to similar interests.
- Clearly define the role for each student in a group (e.g., note-taker, reporter, artist).

**Instruction activities**
- Support verbal information with visuals.
- Include explicit (or direct) teaching of information.
- Provide opportunities for the student to practise and rehearse.

**Level and type of support provided to the student**
- Include tasks that the student can participate in or complete independently.
- Provide opportunities for peer support through small-group activities.
- Have more intensive levels of assistance available as required.

**Task expectations (time, type of task)**
- Build in flexible or extended timelines for task participation and completion.
- Chunk longer activity into smaller segments (e.g., divide a 45-minute activity into several shorter sections).
- Encourage use of technology to complete a task (e.g., keyboarding for written tasks).

**Materials and resources**
- Match materials and resources to the readiness level, interests, and learning profiles of students (e.g., a student with keen interest in vehicles collects data on cars in a parking lot and graphs results).

**Assessment activities**
- Provide a variety of opportunities and ways for the student to demonstrate learning.
- Allow alternatives to written tasks, such as drawings, fill-in-the-blank activities, questions with multiple-choice answers, pointing to the correct answers, scribing.
- Include visual supports such as graphic organizers or highlighting of key words.
Differentiation involves an ongoing process of monitoring student response to the differentiated strategies and evaluating student progress on a regular basis. Strategies that are found to be effective for a student during one activity may be less effective over time or during another activity. The level and type of differentiation will need to be varied according to the student’s response and progress. Data from assessments and observations should be used to inform decisions about the effectiveness of methods being used and further differentiation that may be required.

Visual Supports

The use of visual supports is one of the most widely recommended strategies for teaching students with ASD, as they usually process visual information more efficiently and effectively than information that is presented verbally. Some students may require extra time to process verbal language and understand the message. Speech is transient: once information or instructions have been spoken, the message is no longer available and students must recall the information from memory.

Visual images help students to understand information as they provide a source that can be referred to as often as necessary and for the length of time that is required in order to process the content of the information.

Visuals are mainly used to:

• **Improve communication:** provide a reminder or cue of what to say or do in a situation
• **Provide information:** supplement or provide an alternative to verbal information

For additional information on differentiated instruction, see *Education for All: The Report of the Expert Panel on Literacy and Numeracy Instruction for Students With Special Education Needs, Kindergarten to Grade 6* (Ontario Ministry of Education, 2005a).
• **Support routines**: provide a method to organize or schedule the sequence of activities
• **Teach skills**: clearly delineate content or skill expectations and become a source that can be referred to as required
• **Prevent problems**: present choices and behavioural alternatives
• **Intervene when there is a problem**: provide a clear, consistent, familiar response

(Hodgdon, 1999; Quill, 1995)

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### VISUALS

<table>
<thead>
<tr>
<th>Purpose of visual</th>
<th>Examples of visual supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prompt for transitions</td>
<td>Visual schedule, card with symbol of next activity</td>
</tr>
<tr>
<td>Provide directions or instructions</td>
<td>List of written expectations</td>
</tr>
<tr>
<td>Break tasks into easier to understand steps</td>
<td>Series of pictures to demonstrate steps required</td>
</tr>
<tr>
<td>Provide structure and predictability to routines and activities within the student’s day</td>
<td>Daily schedule or calendar</td>
</tr>
<tr>
<td>Assist in organizing the environment</td>
<td>Labelled objects</td>
</tr>
<tr>
<td>Support appropriate behaviour</td>
<td>Cue cards (e.g., STOP), stories, or written behavioural routines and expectations</td>
</tr>
<tr>
<td>Develop choice-making skills</td>
<td>Choice board with pictures of options, or a written list for students who have reading skills</td>
</tr>
</tbody>
</table>
When planning an activity, it is important to consider ways the information can be presented in a simple, visual format that may be effective for a student with ASD to comprehend.

Visual supports can vary according to the ability of the student to recognize and understand the connection between the visual and the intended message.

In order for visual aids to successfully help a student to learn, they must match the student’s level of comprehension. Some students require very basic, concrete visual objects while others understand and respond to more abstract symbols or written language. Using line drawings or symbols for a student who can comprehend only real objects will cause frustrations for both the student and the teacher. The visuals being used must be easily and quickly recognized by the student. The goal of using visuals is to help a student understand or convey information. Visual supports are helpful to many students with ASD, including those who are able to read efficiently.

“There is a behaviour-communication-visual link:

• The causes of behaviour difficulties are frequently related to communication difficulties: problems in understanding and/or difficulty with expression.
• The remedy to improve behaviour is improving communication.
• The method is using visual strategies to support communication.”

(Hodgdon, 1999)
Visual supports can include visual schedules, checklists, task exemplar sheets, choice boards, illustrated task sequences, printed instructions, rules or topical/content materials, tip sheets, safety signs and messages, videos, and story illustrations, as well as illustrations based on theme content (e.g., the Pioneer Unit).

These are two effective methods of visual support:
1. **Passive modelling** (Biederman et al., 1998): Students are able to see what is expected in a task by being provided with visual examples and demonstrations of how tasks are performed. Instructional language is reduced as much as possible.

2. **Video modelling** (Bellini & Akullian, 2007): Further to and building on the concept of passive modelling, video modelling provides the students with a video example of how tasks are performed and task sequences. This format allows the student to watch the instructional sequence over and over.

In terms of practice, both passive modelling and video modelling are viable tools. Through the use of a digital camera, short instructional sequences on CD-ROMs can be prepared quickly and easily. These sequences can be a powerful addition to other instructional methods and materials.

Visual supports are usually simple and inexpensive. They will be most effective for a student with ASD if they are used consistently and across various settings. For example, a visual schedule used at home to organize the after-school activities for a student will be easier for the student to understand and use if it is referred to daily and follows a format similar to the one used at school to structure the student’s school day.

**Structured Learning Environment**

All children function better in a predictable environment. Students with ASD require a structured learning environment to know what is expected of them in specific situations, to assist them in anticipating what comes next, and to learn and generalize a variety of skills (Iovannone et al., 2003). Rules and expectations
should be clear and consistent and include specific information regarding the expectations for appropriate behaviour.

It is also important to structure the physical environment so that it is organized with “a place for everything and everything in its place”. The student’s seating arrangement needs to be consistent and in a location that affords as few distractions or exposure to sensory irritants as possible. It may be necessary to do environmental scans in all areas of the school that the student will access (e.g., the gym, library, music room) to determine what elements may have an impact on the student’s ability to participate effectively. Appropriate accommodations can then be made to the environment.

Developing as much consistency as possible in the environment, schedule, and instructional approaches provides structure and routines that may increase the comfort level and reduce anxiety for students with ASD. However, there are situations in which changes to the environment and routines during the school day are inevitable. Providing students with what they need to be prepared for these changes, such as advance warnings and concrete visual information, can help them to become more flexible and adaptable to change. Once students know the expectations of their visual schedule and transition system, flexibility training can be built into the process.

Strategies for structuring the learning environment for a student with ASD include:

- Posting the student’s individual rules or guidelines, as well as classroom rules, in a visually accessible location (e.g., beside the student’s desk or workspace)
- Providing clear information about task expectations
- Introducing new or unfamiliar tasks in a familiar environment
- Establishing routines and regularly scheduled activities
- Developing a visual schedule of activities
- Providing warnings before transitions or changes to routines
- Having specific places where materials are stored
- Following a consistent work system.

Tools & Techniques

See Chapter 4:
31. Monday Schedule
32. Classroom/Environment
33. Ten Ways to Create Classroom Structure
Recording changes in the student’s visual schedule and providing opportunities for the student to rehearse and review upcoming changes have been found to be effective in preparing students with ASD for changes to the learning environment and routines.

For example, if the student’s regularly scheduled gym class is cancelled because the gym is being used for another activity, the student will need preparation to understand this change. The change could be explained to the student and visually recorded in the student’s daily schedule with an alternative activity, ideally one that is highly preferred by the student. Involving the student in making the change to the visual schedule and visiting the gym to see the other activity being set up may help the student to understand the change.

Students with ASD are most successful in an organized environment that is structured to be as predictable and understandable as possible.

**Assistive Technology**

In *Education for All* (Ontario Ministry of Education, 2005a), assistive technology is defined as any technology that allows one to increase, maintain, or improve the functional capabilities of an individual with special learning needs (Edyburn, 2000). Its applications and adaptations can help open doors to previously inaccessible learning opportunities for many children with special needs (Judge, 2001).

Assistive technology includes highly technical (commonly referred to as “high-tech”) computerized devices such as speech generating software, as well as less technical (“low-tech”) resources such as visual supports. Technology can be used by students to provide alternative methods to access information, demonstrate and reinforce learning, and interact with others. It can also be used by adults as a tool to support the teaching and learning process.
A research study investigating the use of assistive technology with students with ASD in British Columbia (Randle, 2005) used a survey to identify a wide variety of uses of technology that include supporting the following:

- written output
- academic concept development
- motivation
- communication
- the development of social skills

As the learning needs of students with ASD are diverse, it is important that a student’s specific technological needs be evaluated and that the use of assistive technology be carefully planned. The potential benefits of assistive technology for individual students should be considered from a multidisciplinary and cross-curricular perspective. For example, technology that is used to support a student’s communication skills may also be found helpful to accommodate a student’s fine motor difficulties and increase written output.

The support that is provided through the use of assistive technology will change over time for a student and may vary across activities. For example, a student may require the use of text-to-speech software to support the understanding of information in one subject area, but may not require it to read and understand materials on a topic of interest.

The survey responses from school-based teams in a study on the use of assistive technology with students with ASD in British Columbia indicated that successful implementation of technology appears to depend on several factors such as:

- Match between the technology and the student’s need
- Positive attitude towards the student’s use of technology to access learning
- Interest and comfort level of the teacher and TA in using technology
- Reliable and timely access to technical support, when required
- Student comfort level in using technology with gradual introduction of new hardware and/or software, when required
- Perseverance through problems and challenges.
Ongoing monitoring of students’ needs and use of assistive technology is important to determine if the technology is being used effectively and is providing the student with the intended support. Collaboration between parents and professionals will help to ensure that the technology that is being used is appropriate to meet the needs of the student and is as multi-functional as possible.

Sensory Considerations

Students with ASD vary in their sensitivity and tolerance to sensory stimulation in the environment. It is important to be aware of the sensory preferences or sensitivities of a student and to determine possible elements in the environment that might have an impact on a student’s learning and level of anxiety.

Some students are very (“hyper-”) sensitive in one or more sensory areas and may be more comfortable in environments with reduced levels of sensory stimulation. Other individuals are under (“hypo-”) sensitive and seek enhanced sensory experience. For example, some students become anxious or upset because of an extreme sensitivity to certain sounds or have a difficulty processing more than one sense at a time. Other students seek additional sensory experiences in order to become or maintain calm.

It is usually possible to determine strategies or accommodations that are effective to manage sensory issues. In some cases,

Special Equipment Amount Funding

Special Equipment Amount (SEA) funding assists school boards with the costs of equipment that is not available through the board’s normal textbook, supply, and/or computer purchasing arrangements. Equipment funded through SEA must be recommended by a qualified professional to be essential to support students with special needs and provide students with accommodations to access the Ontario curriculum and/or a board-determined alternative program and/or course and/or to attend school. Evidence of the use of equipment must be documented in the student’s IEP. For additional information on Special Equipment Amount funding, see Special Education Funding Guidelines: Special Equipment Amount (SEA) and Special Incidence Portion (SIP), 2007–08 (Ontario Ministry of Education, 2007b).
environmental accommodations can be made quite easily. In others, students can be taught socially appropriate ways to access sensory materials and experiences. Proactive strategies to manage sensory issues include:

• providing predictable, scheduled breaks for sensory input;
• providing a variety of sensory materials and/or equipment that will mitigate a student’s particular sensory needs;
• using engagement in sensory activities as reinforcement for task completion and other classroom requirements or expectations;
• performing environmental scans across all environments in a school that the student may access in order to determine possible sensory irritants and make adjustments accommodations as appropriate.

Parents are a valuable resource in providing detailed information about their child’s sensory issues. OTs are usually involved in determining the sensory-based activities and materials that will enable a student to regulate his or her arousal level and associated behaviour.

<table>
<thead>
<tr>
<th>Sensory Domain</th>
<th>Hyposensitivity (Seeking Behaviour)</th>
<th>Intervention Strategies</th>
<th>Hypersensitivity (Avoidance Behaviour)</th>
<th>Intervention Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>The student likes to look at spinning objects, flicks fingers, rocks, is attracted to lights</td>
<td>Schedule times in the day for the student to have access to visually stimulating materials</td>
<td>The student closes eyes, rubs eyes, is attentive to details, has good visual memory</td>
<td>Maintain visually well-organized environment, ensure visual clarity within tasks</td>
</tr>
<tr>
<td>Auditory</td>
<td>The student enjoys noisy environment, machines, running water, flushing, loud music</td>
<td>Provide headphones for listening to music, access to musical instruments, environmental sound CDs</td>
<td>The student makes repetitive noises, avoids specific sounds, is a light sleeper</td>
<td>Provide headphones to block sounds; encourage student to listen to soft, peaceful music; provide a quiet workspace</td>
</tr>
</tbody>
</table>
### Understanding Sensory Behaviours (continued)

<table>
<thead>
<tr>
<th>Sensory Domain</th>
<th>Hyposensitivity (Seeking Behaviour)</th>
<th>Intervention Strategies</th>
<th>Hypersensitivity (Avoidance Behaviour)</th>
<th>Intervention Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tactile (Touch)</td>
<td>The student likes to touch people and things, bumps into others, may be self-injurious, has little reaction to pain</td>
<td>Provide items with a variety of tactile qualities, e.g., koosh ball, sand, water, velvet, satin</td>
<td>The student may tolerate a limited number of fabrics, resists physical contact, is upset by crowds</td>
<td>Accommodate clothing issues to the extent possible, respect personal space and comfort level</td>
</tr>
<tr>
<td>Olfactory (Smell)</td>
<td>The student may try to smell people and things</td>
<td>Provide a “Smelly Book” (spices, flavourings, etc.) as a reward or leisure activity</td>
<td>The student avoids people and places (e.g., washroom) that have an odour</td>
<td>Provide an alternative item to smell in difficult locations, provide access to a different washroom, never wear perfume</td>
</tr>
<tr>
<td>Gustatory (Taste)</td>
<td>The student may ingest inappropriate objects, likes strong tastes, may focus on particular foods</td>
<td>Schedule specific times for food to be eaten, do not focus on food variety as a necessity, consider nutritional value</td>
<td>The student prefers bland foods, has active gag reflex, tastes foods cautiously</td>
<td>Consult with the parents to see if a nutritionist or other professional is involved</td>
</tr>
<tr>
<td>Vestibular (Balance and movement)</td>
<td>The student enjoys and needs movement; may enjoy spinning, jumping, and bouncing</td>
<td>Provide opportunities for gross motor activity and access to equipment (trampoline, rocking chair, etc.)</td>
<td>The student may have low muscle tone, avoids gym equipment and movement, has difficulties with balance</td>
<td>Obtain input from an OT, if necessary, to assist in creating a strength-building program; provide opportunities for movement</td>
</tr>
<tr>
<td>Proprioceptive (Awareness of the body and its spatial boundaries)</td>
<td>The student seeks deep pressure, asks for or seeks hugs, walks on toes, grinds teeth or chews inedible things</td>
<td>Consult with an OT regarding items to provide pressure (weighted vest, stress ball, etc.), schedule physical activities (jumping, running, etc.), accommodate need for tight-fitting clothing</td>
<td>The student has poor body awareness, avoids pressure, appears to be clumsy and weak</td>
<td>Provide opportunities for swimming and other exercise</td>
</tr>
</tbody>
</table>
Applied Behaviour Analysis (ABA)

As outlined in Policy/Program Memorandum No. 140, “Incorporating Methods of Applied Behaviour Analysis (ABA) into Programs for Students with Autism Spectrum Disorders (ASD)”, 2007, ABA is an effective approach to understanding and changing behaviour, and teaching new skills. ABA uses methods based on scientific principles of learning and behaviour to build useful repertoires and reduce problematic ones. In this approach, the behaviour(s) to be changed are clearly defined and recorded, and the antecedents and reinforcers that might be maintaining an undesirable behaviour, or that could be used to help develop alternative or new behaviours, are analysed. Interventions based on principles of learning and behaviour are then designed and implemented to develop appropriate behaviours. Progress is assessed and the program is altered if necessary (adapted from Perry, A. & Condillac, R., 2003).

ABA can be used as an instructional approach with students of every age. It can be applied in a variety of situations, and it can be employed for very limited and specific purposes such as the development or reduction of single behaviours or sets of behaviours. ABA methods can be used with varying degrees of intensity along a student learning continuum. ABA is used according to the individual needs of each student, and may be applied to developing academic skills or behaviours related to social skills, communication, or self-care.

The focus in an instructional approach that uses ABA is on measuring and tracking behaviours over time, determining the function of the target behaviour (for the student), and altering the behaviour (either increasing or decreasing its occurrence) by providing intervention. Student progress is based on ongoing data collection and assessment, as measured against the identified objectives. The ultimate goal of using ABA methods is the generalization of the learned skills and behaviours to other settings and situations.
ABA methods can be used to:
• increase positive behaviours;
• teach new skills;
• maintain behaviours;
• generalize or transfer behaviour from one situation to another;
• restrict or narrow conditions under which interfering behaviour occurs.

Examples of teaching strategies using ABA methods include prompts, modelling, reinforcement, task analysis, forward chaining, backward chaining, Discrete Trial Training, and shaping. These are discussed below.

Prompts: Prompts are cues or assistance to encourage the student to provide the desired response. There are many natural prompts in the environment, for example, seeing the school bus

In practice, using methods of ABA involves a number of discrete steps:

Step 1: Clearly define the behaviour to be changed and the goals and objectives for changing the student’s behaviour. It is important to focus on behaviours that can be observed, measured, and tracked over time.

Step 2: Evaluate and record current levels of performance for the targeted skills and behaviours to establish a baseline.

Step 3: Design and implement appropriate interventions. Interventions should be based on an analysis of the antecedents (what comes before behaviour) and reinforcers (what comes after behaviour) that might be maintaining undesirable behaviours or that could be used to help develop alternative (or adaptive) behaviours. A functional behaviour assessment (FBA) is an effective means to determine the underlying function or purpose of behaviours (see “Managing Challenging Behaviours” in Chapter 3 of this guide).

Step 4: Continue measuring the target behaviours to determine if the intervention is effective, and if additional skills or behaviours need to be targeted.

Step 5: Undertake an ongoing evaluation of effectiveness, and make necessary adjustments to maintain or increase the effectiveness of interventions.
arrive, hearing a bell ring, or noticing that students are lining up at the door.

Prompts can be:
• direct (“Put your books on the shelf in the locker”) or indirect (“Where do books need to go?”);
• verbal, physical, or visual (gestures or pictures);
• brief (to get the student started on a task) or intensive (step-by-step through the task).

Some students have difficulty recognizing, understanding, or responding to some prompts. It is important to determine the type and intensity of prompting that the individual student requires. Students can become dependent on prompts from others, so it is important to plan for the fading of prompts when appropriate. Visual supports can provide a method of prompting that many students can learn to use independently. Here, the goal is to help the student become as independent as possible in participating and completing tasks.

**Modelling:** A form of prompting is modelling. It provides a visual example of what is expected in a task by having students see the task being performed. It can also help the student see the sequence of steps in the task. For example, the student learns the actions to a song by first watching a demonstration by an adult.

**Reinforcement:** The target behaviour is encouraged through the use of reinforcement. Reinforcement is provided after the target behaviour to increase the likelihood that the behaviour will reoccur. Reinforcers can be:
• tangible (such as stickers);
• activity-based (the student is able to participate in preferred activity);
• social (praise or thumbs up sign).

Reinforcement can be provided for displaying positive behaviours – to encourage these behaviours to continue – or for refraining from or reducing the occurrence of negative behaviours. It can be something provided (such as praise) or something removed (such as a non-preferred activity being removed when the student asks appropriately).
Reinforcements must be motivating to the individual student. What motivates one student may not motivate another. Similarly, what is motivating to an individual student may change over time. It is important that monitoring be used to ensure that the reinforcer remains effective. In some cases, developing a “menu” of reinforcers may be helpful so that students may select from several options.

To encourage students to be as independent as possible, it is important to gradually change reinforcers from others to more natural reinforcers, such as the satisfaction of completing a task.

**Task analysis:** Task analysis involves breaking tasks down into smaller, teachable steps. Here, the goals for each step are established, and task performance can then be taught according to these steps. Each subtask is taught and reinforced in sequence. In many cases, students may have difficulty only with one step within the larger task, rather than with the task overall. It is important to write subtasks in terms of what the student will do, and to record interventions or prompting that are required for students to complete the subtasks.

**Forward chaining:** When steps within a task are identified through task analysis, use forward chaining to focus instruction to teach the first step or subtask that the student has not mastered, and then assist the student with the rest of the task. Once the student masters the first subtask, then focus instruction on the next step that the student has not mastered, continuing until the student can complete all of the subtasks. For example, in learning to print his or her name, focus the student on learning to print the first letter, and print the rest of letters for the student.

**Backward chaining:** In backward chaining, it is the last step or subtask that a student has not mastered that is focused on first. This provides the student with immediate reinforcement through successful completion of the task. Once this skill is mastered, the focus moves to the next-to-last subtask. For example, a student learning to remove outdoor clothing might initially focus on learning to hang his or her coat on a coat hook after being assisted.
with other steps. Next, the student would learn to take off his or her coat, and then hang it on the hook.

**Discrete Trial Training (DTT):** Like task analysis, DTT involves analysing skills and breaking large tasks into steps or subtasks (or discrete skills). Here, subtasks are usually taught sequentially, and each subtask is mastered before learning the next skill. DTT consists of four steps:

1. The student is given a brief instruction or question (stimulus) that is designed to produce a specific response. If necessary, the instruction is followed by a prompt.
2. The student responds.
3. If the response is as expected, the student receives reinforcement such as praise. If the response is not as expected, the response is ignored or corrected or the student is prompted to provide the expected response.
4. Data are recorded.

Subsequent trials or instructions are then given.

**Shaping:** Shaping involves the use of reinforcements to change behaviour gradually and systematically. Here, approximations of the desired behaviour are reinforced until the target behaviour is achieved. For example, these steps could be followed if the target behaviour is for the student to sit with a group during storytime:

- Step 1: reinforcement for standing near the group
- Step 2: reinforcement for standing closer to the group
- Step 3: reinforcement for standing in the group
- Step 4: reinforcement for sitting in the group
ABA can be used to understand and change behaviour and teach new skills in a variety of ways.

<table>
<thead>
<tr>
<th>Purpose of ABA</th>
<th>Example of Desired Behaviour or Skill</th>
<th>Sample Method to Change Behaviour or Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase positive behaviours</td>
<td>To increase on-task behaviours</td>
<td>The student is allowed to select a preferred activity as reinforcement after working on a target activity. Data are collected to measure on-task behaviours and record reinforcements.</td>
</tr>
<tr>
<td>Teach new skills</td>
<td>To teach the student a motor skill such as throwing a ball</td>
<td>Step-by-step instruction based on a systematic task analysis is provided, using modelling and forward chaining. Praise is provided as reinforcement. Progression of skill development is measured and used to determine whether additional subtasks need to be targeted.</td>
</tr>
<tr>
<td>Maintain behaviours</td>
<td>To maintain the student’s focus on the task</td>
<td>A student who becomes distracted from tasks and is upset when other students finish tasks is systematically taught and prompted to use relaxation techniques, such as deep breathing, as a method to maintain focus on the task.</td>
</tr>
<tr>
<td>Generalize or transfer behaviour</td>
<td>To generalize use of a skill that is used in a specific setting to other locations</td>
<td>Shaping and reinforcements are used to gradually and systematically encourage self-calming techniques that are effective in the resource room to be used on the playground. Data are collected to monitor use and effectiveness of self-calming techniques in other locations.</td>
</tr>
<tr>
<td>Restrict or narrow conditions under which behaviour occurs</td>
<td>To reduce use of inappropriate language</td>
<td>Through the use of Discrete Trial Training and reinforcement, the student learns to replace shouting of inappropriate words with more appropriate language. Data are collected to determine the use of replacement language and to track prompts required.</td>
</tr>
</tbody>
</table>
The methods of ABA that are used within educational programs should be varied according to the strengths and needs of individual students, and the types of behaviours and skills that need to be taught. Some students may require intensive use of some of the above strategies within their program, while others may require the use of ABA as an instructional approach only for very limited, specific purposes. Each student’s pattern of strengths and needs must be analysed to determine the specific learning objectives and teaching methods that are required and most appropriate.

Effective use of ABA methods requires collaboration among parents, educators, and other involved professionals to determine appropriate goals and strategies for achieving them. Collaborative efforts provide opportunities for the generalization of new skills and behaviours across a variety of settings and situations.
Integrating a variety of approaches leads to the development of programs that promote the best outcomes for students. Educational programs for students with ASD are developed through a process of information gathering and consultations to determine the individual learning profile for each student. For many students with ASD, the most appropriate educational program includes a combination of academic goals based on the Ontario curriculum with accommodations or modifications, as required, as well as alternative program goals to support the development of behaviour, communication, social, and functional living skills that are useful and meaningful for the student. The learning profiles for students with ASD are diverse and one specific method or program will not be appropriate for all students with ASD.

A growing body of research indicates that the following essential instructional components are important when instructing students with special needs (including those with ASD):

- Instruction must be of **sufficient duration and intensity** to produce adequate learning and application to new situations
- Students with special needs benefit from **cumulative review** of important concepts and skills
- Students with special needs require **guided practice** to help them bridge the gap between what they know and don’t know, and they need to receive explicit instruction in how to apply learned information in new situations
- Teachers need to monitor their **instructional language** (both oral and written)
- Instruction needs to **integrate both foundation skills and higher-order processes** concurrently for students to be able to apply their knowledge and skills
- Students benefit from clear, organized teaching that **makes explicit connections** across previous and current content areas (Education for All, Ontario Ministry of Education, 2005a).
Literacy Skills

**Reading**

Many students with ASD have strong visual skills and are often more successful in learning to read through a whole word sight recognition approach than through a more traditional phonics program. Whole words that are meaningful are usually easier for students to learn to read than words for which students have no basis of experience or knowledge. In the beginning stages of learning to read, it is critical to enable students to develop a sense of confidence.

While knowing the alphabet and knowing the sound symbol associations are usually regarded as prerequisite skills for learning to read, many students with ASD often have difficulty acquiring these prerequisite skills (Mirenda, 2003). Some students are able to recite alphabet letters and letter sounds by rote, but may be unable to apply this to decoding words in a fluent manner. The rate of reading fluency will affect a student’s ability to comprehend the message of the words. If a student needs to give more cognitive attention to a difficult decoding process, then it is likely that the student’s understanding of what the words are saying will decrease.

Some students may be better able to understand and learn the phonetic components of words after they have learned to read them through a whole word sight recognition approach, working backwards within a top-down framework from the whole to the parts. It is important to consider that, although some students may be unable to manipulate the symbolic representations of sounds, they may still be able to recognize and comprehend words and acquire skills in phonics.

As the student acquires more words, it is essential to provide activities in which these words are used in meaningful contexts. Ongoing practice in sentence construction enables the student to understand how words are organized to express thoughts and needs, as well as how pronouns, articles, and prepositions are used in context. Daily practice in sentence construction provides students with the opportunity to develop an understanding of
grammar and to learn a framework for using language. This practice also reinforces that repetition and rehearsal of language construction are ongoing expectations of daily task performance.

It is important to consider that while some students may not read aloud, they may be able to read and comprehend complex words and passages. It is necessary to provide the student with a variety of opportunities to demonstrate reading ability. For example:

• Students who do not respond when asked to read a passage aloud may be able to select and match pictures related to the words or sentences.
• Manual signs can be paired with printed words and used to indicate word recognition for students who are non-verbal or emergently verbal.

It is essential that students learn to recognize and read words across the curriculum. Reading cannot be confined to reading period, as it is a critical component of every subject area. Subject-specific vocabulary should be taught as one of the components of participation in the curriculum. Key vocabulary for a theme or unit should be determined and then reviewed and reinforced to help students generalize their recognition of the words. Key words can be recorded in a personal dictionary, scrapbook, or theme book, for example, “My Science Words”, and, when possible, paired with pictures so that the visual concept is associated with the printed word.
As students acquire and consolidate sight word recognition skills, add new words to their vocabulary, gradually working from the names of people, objects, and places of interest to vocabulary associated with the curriculum and the environment. Use activities, games, and software to develop and reinforce letter knowledge, phonemic awareness, and grapheme-phoneme relations. Provide students with software (e.g., word prediction, word processor) to support writing efforts. Provide content and stories of interest that will further develop sight vocabulary. Allow for repeated reading of familiar text as this can facilitate fluency and comprehension.

The following strategies help to build literacy skills:

- Include activities to highlight connections between words (e.g., rhyming games, word families, word sorting).
- Provide explicit instruction on decoding “rules” for spelling patterns. Encourage the use of rote memory skills for correct spelling, as well as attempts to use understanding of sound/symbol associations. Provide regular opportunities for practice.
- Use literacy skills to develop and enhance other skills, such as communication and social skills (e.g., talking word processor “reads” to classmates a story written by student).

Reading comprehension difficulties are common for students with ASD. Although some students develop an extensive reading vocabulary through whole word sight recognition or through a strong ability to phonetically decode previously unseen words, they may not be able to comprehend what they are able to read. Students’ motivation to read and comprehension levels are likely to be increased when the vocabulary and storylines are familiar and meaningful. Initially, when students first engage in reading, stories created about family life, pets, favourite television characters, and similar topics will be far more relevant than stories about things, people, and places that are unfamiliar.

Many students with ASD have difficulty with the perception and understanding of sequences. This may lead to a significant challenge in the development of comprehension skills, as understanding causality and making inferences and predictions will be difficult. This difficulty can apply to sequencing skills in both daily life and in reading fiction and non-fiction. Activities such as using picture cards that can be sequenced to create a story or using if/then matching cards help students to develop skills in
perceiving, understanding, and creating sequences. Picture cards that are relevant to the student’s experiences, such as pictures of the student or familiar peers engaged in activities of interest to the student, will be most effective. Illustrations from materials read can be used to help the student sequence events and information.

**Writing**

While some students with ASD are proficient in printing and handwriting, many others have difficulty with written tasks because of difficulties with fine motor skills. The visual-motor coordination and fine motor movements that are required in written activities may be extremely frustrating and divert the student’s attention from the content of what he is writing to the physical process of print production. Difficulties with handwriting have been identified as one of the most significant barriers to academic participation for students with ASD in schools today (Simpson, 2007).

There are many ways in which technology can be used to enhance and compensate for the limitations that students have in their writing skills. If fine motor skills are a barrier to participation and academic function, then seek the alternative of assistive technology.

The use of keyboards, word processors, and writing software has facilitated the writing process for many students with ASD. Learning to use a keyboard is a valuable skill for students to acquire. For many students with ASD, using a computer is a highly preferred activity. Teach and encourage the student to learn to use the keyboard as a writing instrument. This is a reasonable accommodation to the motor planning difficulties often associated with ASD. While learning to print can be a useful exercise for many, when students’ difficulties with penmanship inhibit their ability to demonstrate their knowledge and spark behavioural upsets, the use of the keyboard is a viable alternative.

In many cases, OTs are involved with students with ASD and provide assessments and information on a student’s fine motor and writing skills. OTs can provide recommendations about the strategies, resources, and accommodations that will be appropriate
to assist students with fine motor and writing difficulties. As with other skills, it is essential to focus on the students’ strengths and determine the skills and methods that will be most functional for the students in the future.

When tasks are clarified and accommodated or modified as necessary, many students with ASD are more able to participate.

### Mathematics

For many students with ASD, participation in mathematics can be a challenging aspect of the academic curriculum. There are several reasons for this:

- Although many mathematical concepts can be demonstrated through visual examples, they are often accompanied by sophisticated verbal instruction.
- The language of mathematics instruction has its own vocabulary, and the precision of instruction and usage of terms can vary from one instructor to another.
- Mathematical terminology can be very complex and is challenging for students who struggle with processing the language of everyday interactions.

Along with the use of an alternative writing instrument, strategies that have been found to support writing activities for students with ASD include:

- Fill-in-the-blanks and cloze exercises
- Multiple-choice answers to questions (e.g., students point to the correct answer)
- Scribing
- Exemplars (e.g., samples of work that demonstrate the expectations of the task)
- Reduction in the length or number of written responses
- Division of written tasks into manageable components that focus on one section at a time
- Visuals or graphic organizers to support the written task (e.g., pictures of the sequence of a story)
- Word bank of key vocabulary or frequently used words
- Rubric for task completion that specifies the essential components of a task in a clearly outlined format
Along with the verbal, orthographic, and representational expressions of number, there is also the symbolic representation in the form of numerals. Mathematical operations are usually performed with a pencil. Many students with ASD have fine motor difficulties and learning to form numerals and manipulate them on paper may be challenging.

Students with ASD will probably be more able to comprehend and participate in activities that involve mathematics if they have developed an understanding and ability to:

- match according to various criteria (e.g., shape, type of object, colour);
- sort or separate objects by predetermined criteria (e.g., colour, shape), working towards independently determining criteria;
- pattern through ongoing use of concrete materials, sounds, lines, and so on to copy, extend, and create increasingly complex patterns.

These are some important strategies for building comprehension and enabling participation in mathematics:

- Isolate and illustrate a simple, clear visual example of each mathematical concept. Collect these in a binder so that the student can review them regularly.
- Create a personal dictionary of mathematical terms for the student. It is important for students to know how to read and speak the language of mathematical processes.
- If necessary, break up the instructional period into several discrete segments. Some students with ASD may not be able to sustain their attention on one concept for the length of an instructional period. Breaking up the instructional period also facilitates ongoing review and reinforcement of other aspects or strands of mathematics.
- Use a variety of manipulative materials as an ongoing component of instruction to enable students to generalize concepts across materials.
- If a student has ongoing difficulty with printing numerals, provide an alternative. Using number stamps or performing operations on the computer can enable a student to participate more effectively.
- As many students enjoy using the computer, whenever possible or appropriate access mathematical software that provides visuals that clearly explain and demonstrate concepts.
- Provide opportunities for allowing the student to respond using a multiple-choice format. Pointing to the correct answer may allow increased accuracy of response.
As students enter the higher grades, many have significant difficulty with showing and explaining the steps of their work. Many students with ASD are able to solve equations very quickly and write down the answer without showing all the intermediary steps of how they reached it. This may reflect the inherent fine motor difficulty experienced by the student, as well as the student’s lack of internal language to solve the problem.

Some students may have difficulty verbally explaining how an answer was reached. This reflects the language processing aspect of ASD. When this happens, it will be important to determine what the expectations for the student will be and how the student’s difficulties will be accommodated. It may be necessary to apply a different or modified rubric for assessment.

While some students with ASD are able to participate in some of the strands in mathematics at grade level, many will require significant accommodations or modifications to their programs. Decisions will have to be made regarding the essential components of their ongoing program and participation in mathematics.

As a student comes to each new grade, it is essential to perform an inventory of the student’s skills and carefully review the previous year’s IEP. Information from the plan, as well as a skill inventory, can form the basis of the student’s program. However, it must be noted that if a particular skill area has been worked on for years with little success, the student may not be ready or able to grasp those concepts. It may be more important to focus on other areas that might have more relevance to the student’s experience and functional abilities. For example, it may be more functional and possible for the student to learn to use a calculator rather than to recite multiplication facts.

**Homework**

Many students with ASD have challenges completing homework assignments, particularly as they enter the higher grades where expectations are more sophisticated and complex. There are several reasons for this:

- Many students cannot generalize between environments.

What the students are able to do at school in a particular set
of circumstances, they may not be able to do in the home environment.

- Even with written reminders about task expectations, students may forget or be confused about what they are to do.
- Parents’ language of instruction may be different from that of the teacher. This can cause extreme difficulty both for the parents and the student.
- It may take a student much longer to complete tasks at home because of distractions in the environment and a desire to be doing other things.
- By the end of the school day, many students are exhausted from the energy that they have had to expend to maintain their attention, regulate their behaviour, and participate in tasks. They may not have sufficient energy or attention to be able to continue task engagement through the evening.

While it can be helpful for students to have some homework, this is an issue that must be carefully discussed by the teacher and the family. An important goal is for students to be able to generalize skills between home and school. However, the *quality of family life* is very important and homework should not be the overriding feature of a family’s evening.

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**These are some strategies for positive homework experiences:**

- Reduce the number of questions to be answered.
- Change the writing expectation (e.g., shorter answers, computer-generated responses).
- Watch a story video.
- Watch a task sequence presented through video-modelling/demonstration.
- Listen to a story.
- Draw a picture (if appropriate).
- Play games such as cards (to reinforce mathematics and social skills).
- Provide students with opportunities for homework assistance at school.

Working together, parents and teachers can find the best approach to the nature and amount of homework to be done. *Balance is key.*