

# Guide for Teaching Students Bi-Skiing

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*Local regulations and safety guidelines take precedence over this information. It is in your best interest to exercise due diligence in determining the appropriateness of the information for your particular circumstances. In addition, please take into account any and all factors that may affect your lesson. This includes, but is not limited to the health, well-being, and fitness of the student; weather conditions; terrain; other people on the slope; your own abilities, as well as those of your student and anyone who may accompany you.*

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The bi-ski is a piece of adaptive equipment designed for any skier who has significant challenges with balancing while in motion. These challenges are more frequently, but not always, the result of physical trauma or neuromuscular disorders.

## Diagnoses Common to Students Bi-Skiing

This category includes many diagnoses; however, the levels 1 and 2 bi-ski assessment covers the following:

- Amputation
- Balance impairment
- Brain injury
- Cerebral palsy (CP)
- Cerebrovascular accident (CVA or stroke)
- Epilepsy
- Intellectual disability
- Multiple sclerosis (MS)
- Muscular dystrophy (MD)
- Poliomyelitis
- Post-polio syndrome
- Spina bifida
- Spinal cord injury (SCI)

## Medications Common to Students Bi-Skiing

This category includes a variety of medications which may be used by students bi-skiing; however, the levels 1 and 2 bi-ski assessment covers the following:

- Analgesics
- Antianxiety
- Antibacterials

- Antibiotics
- Anticholinergics
- Anticonvulsants
- Antidiabetics
- Antiemetics
- Antihypertensives
- Anti-inflammatories
- Antispasmodics
- Chemotherapy agents
- Diuretics
- Psychostimulants
- Stool softeners

In addition, there are some skiers who have progressive or degenerative types of disability. They may have started skiing as a two-, three-, or four-tracker but eventually become a sit-skier due to the progressive nature of their disease.

### **Student Assessment**

Thorough student assessments are necessary to determine proper equipment for students. Determining factors are mobility, balance, coordination, strength, endurance, range of motion, strength of limbs, and level of injury. Assessments should explore students' diagnosis. However, complete assessments go beyond this and are imperative to determine the physical, cognitive, and emotional strengths and challenges of each person. A thorough check of current medications provides important information relative to stamina and sensitivity to the environment, as well as attentiveness and interpersonal skills. Treat every student as an individual; the strengths and challenges of individuals, even with the same diagnosis, can vary dramatically from student to student.

The physical assessment (i.e., mobility, balance, coordination, strength, endurance, range of motion, and strength of limbs) provides helpful insight. The assessment provides indications to the equipment needed to create a successful learning environment. Even after an assessment is completed, adjustments may need to be made, due to students' abilities demonstrated throughout the lesson.

For students with spinal cord injuries, a general guideline is that those with a T-6 and lower level of injury use mono-skis. Students with higher levels of injuries usually use bi-skis. Each injury is somewhat different; the effects of a T-6 injury in one individual may vary from the same level of injury in another individual. In addition, a person may have an incomplete spinal cord injury. This means they have some level of motor and/or sensory function below the level of injury.

Some medical concerns associated with students bi-skiing include bowel/bladder management program (e.g., leg bag, catheter, etc.), pressure sores, spinal fusion, spasticity, sensitivity to

hot or cold, and poor circulation.

Another point of concern is autonomic dysreflexia. This is a potentially life-threatening, hypertensive occurrence produced by the body's inability to sense and react to specific stimuli. Possible symptoms include a feeling of impending doom, flushing of the skin, sweating, blurred vision, and a sudden change in the ability to comprehend or communicate. Common causes include bladder or bowel distension, pressure sores, severe cold or heat, or severe blows to the body or head. If an instructor suspects autonomic dysreflexia, immediate action must be taken to eliminate the cause. Students should be kept upright, straps loosened, and taken to a warm place. Ski Patrol should be called immediately—this is a medical emergency.

A review of current medications should be discussed during the assessment. Medications taken by students can have an impact and need to be reviewed. It is important to learn about intended effects and any side effects students may experience or are experiencing. Side effects of medications can, for example, make someone more susceptible to bruising or bleeding, listless, slow to respond, nervous, sensitive to the sun, or muscularly weak. Accurate timing of medication administration is important to prevent adverse reactions due to lack of medication, or low medication levels in the body. Instructors should not administer medications unless qualified to do so.

In addition to the physical assessment, cognitive and affective assessments should also take place. This helps to determine if students have specific triggers that could cause hyper-reactivity and more, as well as other activities they participate in, likes, dislikes, motivations, goals, and fears. This provides a platform from which to design the lesson plan. Determination of learning preference is ongoing throughout the assessment process and during the lesson. Students learning preferences can be matched with complementary teaching styles and an acceptable pace, which is based upon the cognitive, affective, and physical assessments.

It is valuable to know other interests and sports activities in which students participate. Bicycle riding may indicate some balance, judgement abilities, and/or upper body strength. Ball activities indicate eye-hand coordination and some spatial judgment. Knowledge of sports, activities, and interests, plus information about students' daily schedule can help you assess both physical and cognitive abilities. This may also be useful while teaching and the use of teaching for transfer.

Skill development should be modified to align with the physical and cognitive abilities of students. Matching learning preferences with teaching styles enhances the learning environment for students. Frequent demonstrations and a focus on small, obtainable goals and accomplishments is one of the most successful teaching strategies. Providing individual positive feedback along the way helps to maintain motivation and interest. As with all students, those who have cognitive diagnoses benefit from an individual assessment and tailored lessons.

In addition to students, other resources may offer valuable insights. Parents/guardians, spouses, or other caregivers can provide detailed information regarding students physical abilities and cognitive processing strengths and needs. Many schools have a Special Education Team that creates an Individualized Education Program (IEP) for school and the parents/guardians of children with special needs. This information may assist with your initial assessment of students. Be sure not to ignore students as you are gathering additional information.

One-on-one phone conversations are extremely valuable prior to the actual lesson. The more communication and assessment done up front, the better!

Finally, it is extremely important to help this group of skiers develop sound fundamental skills. The lesson plan follows the alpine skill development progression with obvious modifications to maximize students' physical abilities. The focus is the development of the three skills supported by the five fundamentals, regardless of where the movements originate.

### **Equipment and Set Up**

Take time to initially set up and evaluate students to determine which type of equipment is best. Do not rush the set up for first time skiers! Proper time spent during the initial set up will equal success and enjoyment for students in the long term.

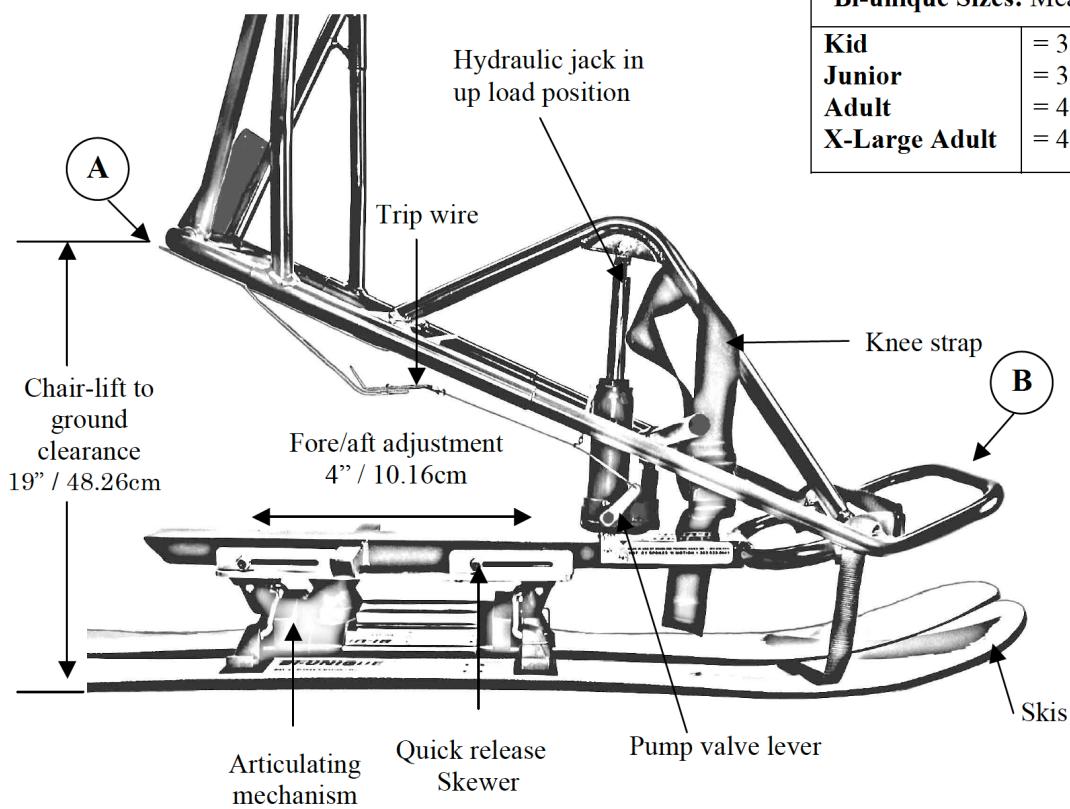
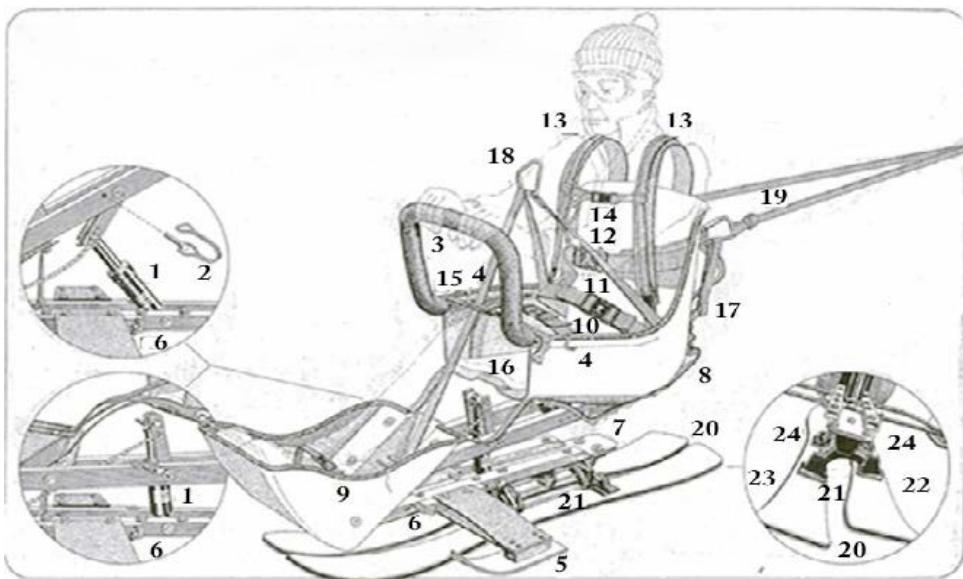
The bi-ski has a seat and frame system, equivalent to a stand-up skier's boot, that is mounted to a suspension system. The suspension system is usually mounted on two short skis with a radical side cut. Most bi-skis have fixed outriggers that can be mounted on the frame of the bi-ski. These outriggers can be adjusted as needed or removed. Bi-skis have a tethering system that allows instructors to assist bi-skiers in turning, speed control, and in emergency situations.

Fixed outriggers are most frequently used with skiers who have limited physical abilities, cognitive challenges, and/or physical diagnoses that limit their ability to balance and/or support themselves with handheld outriggers. If fixed outriggers are used, using tethers are mandatory to assist students and safely control bi-skis. Be sure to follow industry best practices and program, school, and resort policies, procedures, and practices.

If skiers possess the necessary strength, balance, and agility, handheld outriggers may be used in place of fixed outriggers. This allows skiers to ski independently.

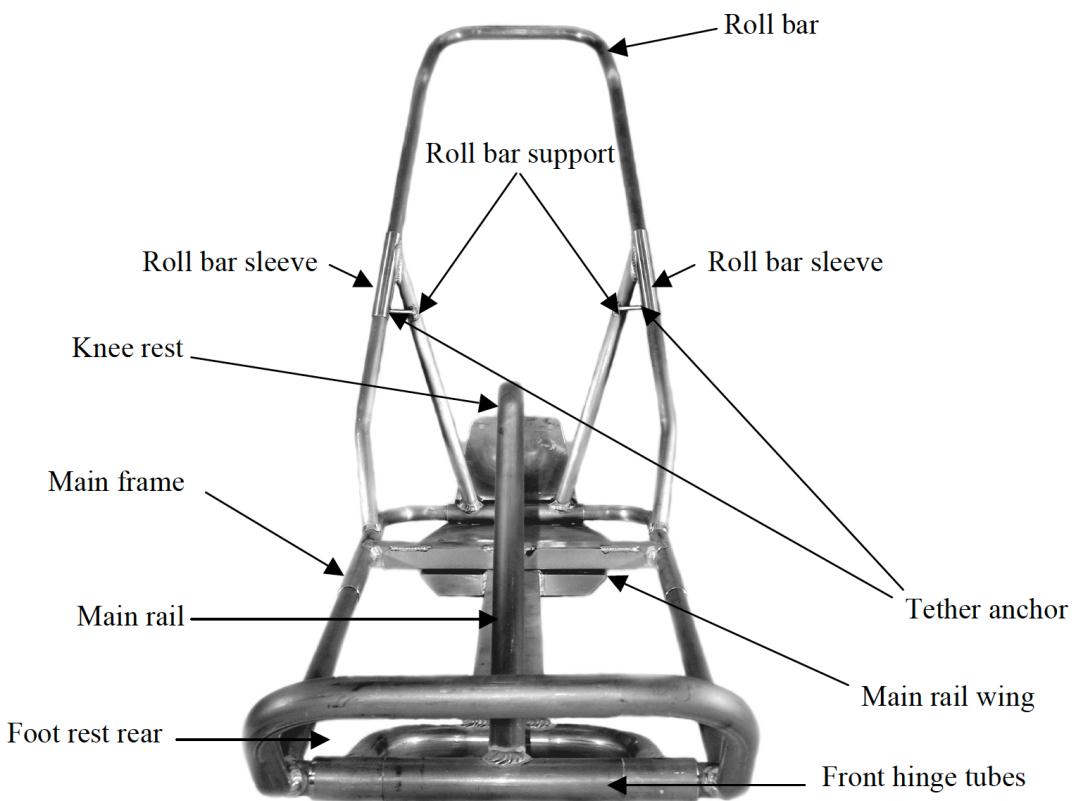
Certain bi-skis have a self-loading device allowing strong, well-balanced, and agile bi-skiers to load independently. Other skiers bi-skiing need one or two lifting/loading assistants.

A complete physical assessment can help you determine how bi-skis should be adjusted to an individual. As with the mono-ski, the bi-ski should be appropriately balanced, and skiers should be properly fitted to the ski.



**Bi-unique Sizes: Measure from A to B**

<b>Kid</b>	= 33.25" / 84.45cm
<b>Junior</b>	= 37.50" / 95.25cm
<b>Adult</b>	= 41.50" / 105.41cm
<b>X-Large Adult</b>	= 46.50" / 118.11cm



## Safety Issues and Lift Evacuations

Be aware of these points to keep students bi-skiing safe:

- Your Responsibility Code applies to all skiers, including those bi-skiing.
- Instructors must understand the hand signals for communication with lift operators (i.e., slow, stop, maintain speed). Some hand signals may differ by ski area.
- Evacuation straps on the bi-ski must be regularly checked for wear and be replaced or repaired, as necessary.
- The evacuation system must always be ready for evacuation and not intertwined with the seat straps of the skier.
- Evacuation is always directed by Ski Patrol and it is at their discretion to use an alternate system.
- The National Ski Patrol recommended procedure for bi-ski lift evacuation is termed a double carabiner with opposing gates. Evacuation carabiners must only be mounted to a manufacturer-suggested evacuation strap (i.e., single- or three-point strap system).

## General Overview of Lift Loading Procedures

These are general procedures for instructor-assisted chair loading and unloading of students bi-skiing.

- Take the time to ensure everyone, students and all instructors, understand each of their roles and responsibilities during the loading and unloading processes. Establish who will

communicate with lift operators, be responsible for calling the timing of the load and unload, connect and remove the safety strap and carabiner, etc.

- Instructor calls a count or cadence (example: Ready, 3, 2, 1, lift up and back) when in the loading zone of the chairlift. For timing and safety concerns, it is a good idea to practice a lift with students and, if applicable, the assistant, out of lift lines and before the first load of the day.
- A lift operator must be ready to press the stop button in case of a misload. If a second lift operator is available, s/he may assist with the lift loading. Be sure to follow industry best practices and program, school, and resort policies, procedures, and practices.
- Once on the chairlift, attach safety strap and carabiner to the chair. Be sure to follow industry best practices and program, school, and resort policies, procedures, and practices.
- Some programs and students put the bar down. When using the bar, keep it down during entire ride and take care not to lean on it, as this might put extra weight on the students' legs.
- After entering the unloading zone just prior to the unloading platform, disconnect the safety carabiner and strap and lift the bar. Make sure all straps, clothing, and outriggers are free of the chair to set up for a clean unload.
- At the unloading area, the instructor calls a count or cadence (example: Ready, 3, 2, 1, lift up and down) and s/he continues to guide/seat assist the student off the chairlift and to the side, out of the unloading area.

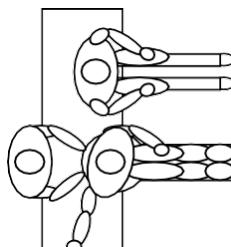
### Lift Loading Assists

Chairlift loading procedures vary due to chair or loading area configuration and program and resort policies and procedures. Keep in mind these general guidelines for lift loading assists:

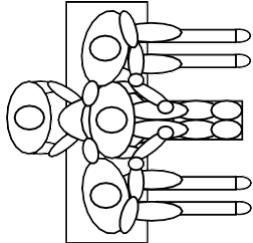
- Always lift with the back upright, in a wide stance, and using the legs and biceps.
- Make sure proper communication has occurred between the student, instructor, instructor assistant, and lift operator.
- Below are three assists that may be used with students bi-skiing, an instructor, and an instructor assistant: lift and pull-back, lift with a front push-back, and lift with a side push-back. Remember one lift operator must always attend the stop button in case of a missed load! If a second lift operator is available, s/he may assist with the lift loading. Additional, loads can be found in the *Adaptive Alpine Technical Manual* (PSIA-AASI).

#### Pull back

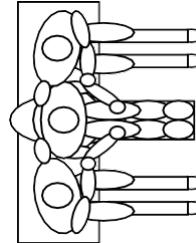
The second lift operator reaches over the chair, grasps the handle on the back of the bi-ski and pulls it back onto the chair. This is usually used for fairly independent bi-skiers.



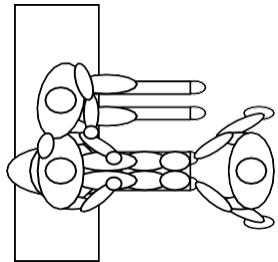
### Lift and pull-back



The instructor and instructor assistant stand on either side of the bi-ski, with skis pointed in the lift direction, hips and shoulders turned slightly toward the bi-ski and chair. They grab the side handles. While they are lifting up and pulling back toward the chair from the sides, the second lift operator reaches over the chair, grasps the handle on the back of the bi-ski, and pulls it back onto the chair. If a second lift operator is not available for lift loading assistance, the instructor and instructor assistant perform a lift and pull-back by themselves.



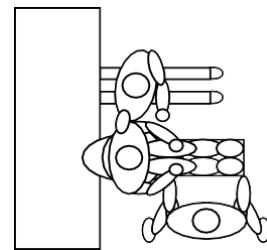
### Lift with a front push-back



The instructor stands at the side of the bi-ski, with skis pointed in the lift direction, hips and shoulders turned slightly toward the bi-ski and chair. The second lift operator stands in front of the student, looking directly at the student and the on-coming chair, and grasping the foot support with both hands. While the instructor lifts up and pulls back from the side, the lift operator lifts from the front and pushes the seat up and back onto the chair. This assist can be useful with a small student in a bi-ski with an instructor who just needs an extra push back.

### Lift with a side push-back

The instructor stands at the side of the bi-ski, with skis pointed in the lift direction, hips and shoulders turned slightly toward the mono-ski and chair. The second lift operator, or second loader (boot loader) with skis/snowboard removed (e.g. on a double chair), stands on the other side and 90° to the lift direction. The instructor and second loader grasp the side handles and lift up. The instructor pulls back toward the chair while the operator pushes back.



### **Tethering a Bi-Ski**

When tethering a bi-ski, the goal is for instructors is to provide safe environment and smooth assistance, as needed, for speed control, turn initiation, braking, stopping, and obstacle avoidance. Since tethering procedures can vary, it is imperative to understand and adhere to the tethering and tether safety protocols of your program, school, and resort.

### Attaching the tethers to the bi-ski

The design and attachment of tethers varies greatly by ski program and by the structure of the specific bi-ski. Moreover, the ability of the student can affect the tethering techniques. These are some of the variables in design and attachment of the tethers:

- Two tethers versus one single looped tether
- Two points of attachment to the ski versus one point of attachment
- Attachment low on the ski versus high on the ski
- If skiers are bi-skiing with fixed outriggers, there is no braking mechanism or ability for the students to stop the equipment. In this situation, the instructor tethering controls the equipment and student in turning, slowing, or stopping. Be sure to follow program, school, and/or resort practices and procedures for attachment of the tethers to the bi-ski and tethering techniques.

### Attaching the tethers to the instructor

There are several key points to remember when attaching the tether to yourself:

- If you are the sole command of a bi-skier on the slope, you must always maintain tether contact. Be sure to follow program, school, and/or resort practices and procedures for attachment of the tethers to the instructor.
- Attach the tethers to your wrists using a girth hitch, maintaining skin contact. Tethers should be beneath your gloves and jacket.
- Do not attach the tethers to your upper arms. Attaching to your upper arms is less effective and efficient. Sometimes instructors attach tethers to their upper arms because the tethers are too long. Adjust tether length, if necessary.
- Use a second back-up safety attachment when required by your local program/resort. One end is fastened to the tether and the other end is fastened to your wrist, arm or waist. A carabiner is often used for this attachment.

### Body position

Body positioning is especially important for successful tethering. You should be behind and slightly uphill of the bi-skier. In most cases, you have a slightly narrower corridor than the bi-skier. Positioning too far outside of or below the bi-skier's corridor diminishes your ability to guide, control, and stop the student bi-skiing, and can be hazardous for the tetherer.

Stay in sync with the bi-skier. Look for subtle cues, such as a tilt of the head, to time your assistance with students' turn initiation.

### Feet and skis

Ideally, you can make stem/step turns in sync with the bi-ski. See the *Adaptive Alpine Functional Skiing Assessment Material and IDP* for details on how to perform this maneuver.

The wedge may also be used to effectively tether bi-skis, especially when coming into crowded areas or on flat terrain. Beginning tetherers often learn to tether using the wedge in order to master body and hand position. Progressing to stem/step turns is generally kinder to your hips and knees, is usually a stronger position from which to tether, and can impart smoother turn transition for students.

Parallel to parallel tethering should only be used by strong, experienced tetherers who have already mastered wedge and stem/step tethering. Use caution with parallel to parallel

tethering, as it is easier to catch a downhill edge, potentially causing the tetherer to fall. Unless it is done smoothly and with finesse, it can prematurely pull students into the fall line, preventing them from making complete turns and causing a rough ride.

### Hand and arm position

For maximum control and stability, hands and arms should be closer to your center of mass. This is known as the “power box”. In this position, hands are between hips and chest; arms are flexed, with elbows ahead of your spine (similar to carrying ski poles). When hands and arms are outside of the “power box,” you may reduce your ability to guide, control and stop the student. Arms should be used as extension and retraction tools while remaining neither at full extension nor retraction.

### Tether handling

There are several different techniques that can be employed to initiate turns, including pulling the tether, wrapping the tether in, or lifting one tether to initiate the turn while lowering the other to control impact of fixed rigger touching the snow. Regardless of what technique used, practice is critical to develop a feel for what is most effective.

Smooth tether handling is critical for student safety, skill development, skiing ability and enjoyment. You should be able to release and gather the tether with ease; there should never be so much slack that you risk tripping/skiing over the tethers.

The tightness of the tether lines can vary based on the needs of students. In general, more advanced students benefit from light guiding of the tether lines, used as ‘teaching tethers’, not a control device. Beginning students, on the other hand, may need the greater instructor control that is available with tighter tether lines. Beware that too tight of a tether can inhibit bi-skier input into the turn.

### Emergency stops

This is a required safety maneuver for all bi-ski instructors. It is used to quickly stop the bi-ski and avoid hazards such as trees, lift towers, and other people on the slopes. The movements are similar to the Linked Sideslip with a Hockey Stop to either side of the *Adaptive Alpine Functional Skiing Assessment Material and IDP*. It should be performed precisely and quickly. Poor body alignment can hinder your ability to stop and may cause students in the bi-ski to flip.

### Seat assists

Seat assists are used in a variety of circumstances: in lift lines, on cat roads, when an outrigger is broken, and/or when a student is fearful or fatigued. It can also be used with beginning students to help them feel their balance and to give them kinesthetic feedback as they learn how to bi-ski. In general, seat assists should not be used to “take the student for a ride.” Instead, you are encouraged to promote the student independence to the highest possible degree.

Consider safety implications when seat assisting. When performing a seat assist, use a wide-distance, skidded parallel technique. It is best to avoid using a wedge, so your ski tips do not get caught under the bi-ski tips. In most cases, seat assists are used over very short distances. When it is necessary to seat assist on long runs, you should remove the fixed outriggers as a safety consideration. Lastly, for the safety and enjoyment of students as well as other skiers, do not take up the entire width of the slope while performing a seat assist.

### Tethering exercises

The following exercises may be used to improve tethering techniques:

- Develop strong skiing skills. In particular, mastery of the following maneuvers can improve tethering skills:
  - Stem/step turns
  - Falling leaf
  - Side slip to hockey stop
  - Synchronized skiing (with visual and verbal cues)
- Practice tether management. At home attach tethers to a chair and practice wrapping (gathering) and unwrapping (releasing) the tethers. Next, practice smoothly releasing the tether and then gathering it back up. Make sure you do not have slack to trip over.
- Practice tethering without the bi-ski. Use a stand-up skiing partner who is skiing in front of you, just as a student in a bi-ski would be in front of you. This partner should not be attached to the tethers but, instead, should hold them loosely and drop the tether for safety, if needed.
- Use guided discovery to find the “power box” hand and arm position. Hold your hands high, low, and in-between until the height of the “power box” is established. Then determine the width of the “power box” by holding your hands close together, far apart, and in-between. Finally, play with the flex of your arms, moving from straight arms to a tight-angled bend and in-between. As above, this exercise should be done with a stand-up skiing partner, not with students in bi-skis.
- Practice tethering, emergency stops, and seat assists with other instructors in bi-skis. If possible, practice these maneuvers on people of varying weight and height. Have them role play different levels of ability. Practice until you consistently use effective body position and foot movements. Feel how different techniques affect the students and the bi-ski. Notice the difference between full control and gentle guiding. Practice on easy terrain and progress in terrain difficulty as tethering skills and experience increase.
- Be tethered by another instructor in a bi-ski if you meet the weight restrictions of the bi-ski. This will help you understand the experience of your bi-skiers. Notice which tethering techniques are helpful and which techniques hinder your progress.

## Skill Development for Common Bi-Ski Outcomes

Local regulations and safety guidelines take precedence over this information. It is in your best interest to exercise due diligence in determining the appropriateness of the information for your circumstances. In addition, please account for all factors that may affect your lesson. This includes but is not limited to the health, well-being, and fitness of the student, weather conditions, terrain, other people on the slope, your own abilities, as well as those of students and anyone who may accompany you.

### Beginner / Novice Zone Outcomes

#### Level 1: Welcome to Skiing / Build the Foundation

- Perform student assessment.
- Discuss medical history.
- Determine and share goals.
- Select, introduce, and set up equipment.
- Agree on student / instructor communication, safety, and emergency stop.
- Perform static balance exercises and develop athletic stance, indoors.
- Perform pushing, turning, pivoting, and balancing drills on flats.
- Begin to understand the fall line and terrain changes.
- Learn how to safely fall and get up.
- Learn to slide at slow speed.
- Glide and slide across the slope.
- Perform a straight run to a terrain-assisted stop.
- Develop effective outrigger and body position while moving.

#### Level 2: Introduction to Turning

*Note: Turning at this level achieved through balance and rotary or edging skills*

- Develop stopping and slowing skills via skis and outriggers.
- Turn left and right to a stop.
- Perform linked turns.
- Begin to vary shape and size of turns.
- Develop effective outrigger and body position for turning.
- Perform outrigger-equivalent braking wedge.
- Learn how to ride chairlift.
- Review lift evacuation procedures.
- Learn safe outrigger position and timing while loading and unloading.
- Introduce sideslip skills in the beginner area.

#### Level 3: Introduction to Green Terrain

- Explore terrain – go for lots of quality mileage!
- Actively skid or edge the skis for turn shape and speed control.
- Begin to use turning movements to initiate a turn.

### Intermediate Zone Outcomes

#### Level 4: Mastering Green Terrain

- Refine the ability to control the skis by turning and tipping the appropriate body parts.
- Perform skidding exercises.
- Perform edge control exercises.
- Explore all green terrain in a variety of snow conditions.
- Experiment with turn shape and size.
- Solidify a release move to initiate a turn.
- Use hockey stops.

#### Level 5: Developing Skills to Enhance Parallel Skiing

- Use independent outrigger action.
- Improve dynamic balance, increase range of motion, and feel the edges.
- Gain an understanding of upper and lower body separation.
- Develop edge release for parallel turns on blue terrain.
- Control speed on green and groomed blue terrain by blending skills and using tactics and turn shape.
- Develop long- to medium- and medium- to long-radius turns.
- Ski a "green line" in the bumps.

#### Level 6: Anchor Parallel Skiing & Learning Tactics for Bumps and Variable Conditions on Blue Terrain

- Link open parallel turns with emphasis on rotation and edging.
- Perform medium to short radius turns.
- Ski varying snow conditions.
- Carve uphill arcs.
- Refine tipping movements to become more dynamic.
- Perform short radius turns while developing upper and lower body separation.
- Create body angulation.
- Explore using skidded and carved short turns as tactics for speed control on steeper terrain.
- Explore powder, crud, and cut-up snow conditions.
- Ski a "blue line" in the bumps.
- Load and unload on lift independently.
- Develop total independence.

#### Advanced Zone Outcomes

#### Level 7: Linking Parallel Turns on All Blue and Some Black Terrain and Increasing Confidence in Variable Terrain and Conditions

- Perform carved railroad track turns.
- Perform hip check turns.
- Continue to refine skill blending for parallel turns on all blue and some black terrain.
- Explore a variety of turn shapes on groomed and variable terrain
- Explore tactics for skiing all terrains.

#### Level 8: Mastering the Mountain and Exploring the Latest Ski Designs

- Continue to enhance upper and lower body separation.

- Carve medium- and long-radius turns.
- Refine edge engagement and release movements, changing line, turn shape, and speed to adapt to challenging terrain and snow conditions.
- Refine flexion and extension movements to maintain balance, manage uneven terrain, and allow the efficient blending of all other movements.
- Perform short radius turns using upper and lower body separation in variable conditions to develop more speed control and manage terrain more efficiently.
- Ski the “black line” in the bumps.
- Become comfortable skiing all the mountain’s most difficult terrain.

**Level 9: Skiing Any Turn, Anytime, Anywhere, and in Any Snow Condition**

- Increase confidence in ski design and speed in a safe environment (especially useful for the skier interested in racing).
- Refine flexion and extension movements to enhance turn mechanics.
- Use timing and tempo to enhance the release of the old edges, tipping skis from turn to turn while reducing anxiety and fatigue to allow for more enjoyable skiing on challenging terrain.
- Refine movements and options in short radius turns, adjusting tactics at will.
- Explore alternative movement blends and tactics for variable conditions, skiing the entire mountain efficiently.