This technical section presents the progressions from first time through to expert skier. It focuses on skiing on groomed terrain and includes a description of how the ski interacts with the snow, the movement focuses, and an outline of the progressional steps needed to develop an appropriate lesson plan. Situational skiing – hard pack, bumps, powder, steeps and variable off-piste is covered in the next chapter.

5.1 THE THREE PHASE TURN

A three phase model is used to describe the turn and the movements made throughout the turn, enabling instructors to break the turn down into separate parts and describe and analyse what happens throughout the process.

1. THE INITIATION PHASE – THE BEGINNING OF THE TURN

2. THE CONTROL PHASE – THE MIDDLE OF THE TURN

3. THE COMPLETION PHASE – THE END OF THE TURN

The three phase turn
5.2 THE FIRST TIME SKIER

5.2.1 INTRODUCTION TO SKIING

Skiers learn about:
• ski equipment – how to adjust boots for comfort and performance, how to put on/take off skis
• the environment – snow, terrain, weather, safety factors
• mobility – moving around on the skis on flat terrain
• an athletic stance

Movement Focus
• fore/aft – creating balance over the entire foot
• lateral – even weight distribution on both skis

Terrain
• the ideal terrain for skiers at this level is a large flat area

Progressional Steps
• introduce the environment
• introduce the ski equipment and explain its function
• put on one ski and introduce the reaction of the ski on the snow
• introduce mobility exercises on one ski (ensure this is done on both feet)
• put two skis on and introduce an athletic stance
  (see Chapter 2.1.1 Skiing - A Sport of Movement pg. 40)
• move around on two skis focusing on maintaining an athletic stance
• introduce mobility exercises

5.2.2 STRAIGHT RUNS

A straight run is when skiers slide down the hill with the skis parallel while maintaining an athletic stance. It is used to develop a good athletic stance which is fundamental to the skier’s success, making it easier to learn and develop the movements of skiing.

Ski/Snow Interaction
• skis are parallel and flat to the snow
• skis are pressured from the centre
• skis are approximately hip width apart

Movement focus
• fore/aft – creating balance over the whole of the feet
• lateral – even weight distribution on both feet and the centre of gravity remains between the feet
Terrain
• the ideal terrain is a gentle slope with a flat or uphill run out

Progressional Steps
• review athletic stance
• have students try and maintain an athletic stance while sliding down the hill
• challenge students’ fore/aft and lateral balance with exercises such as flexing at ankles, knees and hip while sliding, leaning forward and back, lifting one ski off the snow, jumping

5.2.3 GLIDING WEDGE

A gliding wedge is created by blending lateral and rotational movements of the legs to form a wedge shape with the skis.

A gliding wedge allows skiers to:
• increase their stability due to the feet being moved further apart, creating a wider base of support
• create steering angles. This is the difference in direction between the skis and the direction of the skiers momentum and introduces leg rotation
• control speed. The wedge shape creates more friction because the edges are engaged with the snow

Ski/Snow Interaction
• skis are rotated and tipped at the same rate and time and for the same duration to create a symmetrical wedge shape
• inside edges of the skis are engaged due to lateral displacement of the skis
• the combination of the wedge shape and the edge engagement creates friction against the snow

Movement Focus
• lateral – legs are abducted. This creates inclination of the legs and angulation at the hip and the skier will be balanced on the inside edge of both skis. The centre of gravity remains between the feet
• rotational – femurs are rotated inwards with the pivot point being under the feet
• these movements should occur simultaneously

Terrain
• the best terrain is a gentle slope with a flat or uphill run out. Introducing the wedge should ideally be taught on the same terrain as straight runs

Progressional Steps
• introduce the wedge on flat terrain
• teach the lateral and rotational movements
5.3 WEDGE TURNS

Turning is a more effective method of speed control than skiing straight down the fall line in a wedge. Speed control becomes a result of direction changes rather than wedge size. Once mastered the wedge turn will allow skiers to access more terrain.

5.3.1 SHALLOW WEDGE TURNS

This is the first step in the learning to turn process. A consistent gliding wedge is maintained with the skis and the skier will make shallow turns. Speed control is still a result of the gliding wedge.

Ski/Snow Interaction
- the skis will maintain a consistent wedge shape throughout the turn
- slight edge angle is created due to the shape of the wedge
- skis are on opposing (inside) edges
- skis will turn across the fall line at a slow and consistent rate
- ski/snow pressure will increase slightly on the outside ski
- the wedge shape controls speed

Movement Focus
- rotational – while maintaining a gliding wedge both femurs will be rotated in the desired direction of travel, the upper body will remain stable, creating some rotational separation between the upper and lower body. The range and the duration of the rotation will dictate the size and shape of the turns

Terrain
- a gentle beginner slope. The ideal terrain is that on which the skiers are able to maintain a gliding wedge and control their speed

Progressional Steps
- briefly explain how to turn and let the skiers put into practice
- teach leg rotation
- encourage skiers to rotate their legs while maintaining a stable upper body
- focus on a shallow turnshape to help with upper body stability
5.3.2 BASIC WEDGE TURNS

A basic wedge turn is created by increasing the duration of the turning skills learned in the shallow wedge turn. Turn shape will slowly increase until the skier is able to turn to a stop. This provides confidence to ski faster and/or move to steeper terrain.

Ski/Snow Interaction
- the skis will maintain a consistent wedge shape throughout the turn
- slight edge angle is created due to the shape of the wedge
- skis are on opposing (inside) edges
- skis will turn across the fall line at a slow and consistent rate.
- ski/snow pressure will increase slightly on the outside ski
- speed is controlled by the shape of the turn and skidding

Movement Focus
- rotational – the movement is the same as the shallow wedge turn but the duration of the turning force applied to the skis is increased to turn the skis further across the hill

5.3.3 ADVANCED WEDGE TURNS

This is a skidded turn where the skis are held in a gliding wedge throughout the turn. Lateral movements are developed to give the skier more edge engagement through the control and completion phases while vertical movements are used to blend lateral and rotational movements and aid with rhythm. Skiers at this level are travelling at a faster speed than in the basic wedge turn and the addition of lateral and vertical movements allows them to deal with the forces created by this increased speed.

An advanced wedge turn gives more control and allows skiers to go to steeper terrain.

Ski/Snow Interaction
- the skis maintain a consistent gliding wedge size throughout the turn and leave a brushed track on the snow
- edge angle on the outside ski will increase slightly and penetrate the snow more during the second half of the control phase and throughout the completion phase of the turn, due to lateral movements. Combined with an increase in speed this will utilise ski design
- new inside ski will flatten slightly during initiation phase due to realignment of the centre of gravity between the feet
Movement Focus

• lateral – as the centre of gravity moves slightly further inside of the outside foot during the second half of the control phase, and throughout the completion phase of the turn (due to slightly increased speed of travel), the upper body moves more towards the outside ski
• vertical – flexion is used during the second half of the control phase and the completion phase to aid in the blending of lateral and rotational movements balancing the upper body towards the outside ski. Extension is used during the initiation phase to blend rotational and lateral movement and aid in realigning the centre of gravity over the base of support, redistributing weight on to both feet and realigning the legs

Terrain

• ideally introduced on easy green terrain with the goal of progressing to steeper green terrain

DEVELOPING AN ADVANCED WEDGE TURN

Lateral Movement

Lateral movement is introduced through the second half of the control and completion phases of the turn. It strengthens rotational movement and allows skiers to better deal with the forces acting on them as they turn across the hill. Having more weight on the ski on the outside of the turn allows that ski to penetrate the snow and creates edge engagement.

Progressional Steps

• guide students into discovering a change of weight distribution from foot to foot
• explain how the upper body needs to adjust to move the balance to the outside foot
• try this by practicing through the completion of the turn
• explain the timing of the lateral balance and teach students how to bring the balance back between the feet so that the skis can be rotated into the new turn
• develop this movement with exercises

Vertical Movement

Vertical movement is used to aid and blend the other three movements, and create rhythm and flow.

Flexion through the control and completion phases of the turn allows the skier to:

• balance on the outside ski more effectively
• lower the centre of gravity to better deal with the forces created by turning across the hill
• create stronger rotation
• maintain good fore/aft balance

Extension at the initiation and through to the middle of the control phase allows skiers to:

• more effectively redistribute weight over both skis
• flatten the new inside ski on the snow allowing it to be rotated easier
• maintain good fore/aft balance

Once vertical movement is added skiers will be able to make a round wedge turn using all four movements of skiing. Vertical movement will aid the other movements to create an advanced wedge turn that will allow skiers to ski faster and to ski on steeper terrain.

To achieve this skiers need to:

• move vertically (flex and extend) using the ankle, knee and hip joints
• time their vertical movements so that flexion begins in the middle of the control phase and continues through to the completion of the turn and extension begins at turn initiation and continues through to the middle of the control phase

Progressional Steps

• introduce flexion movement and teach while stationary
• blend it with the lateral movement while stationary
• add the flexion movement to the lateral balancing movements while
turning. Keep the movements blending by encouraging skiers to flex and rotate their legs
• develop this with exercises
• introduce the extension movement by having the skiers stand taller during the initiation of the turn focusing on distributing the weight evenly between both skis
• develop this with exercises
• encourage rhythm and flow

5.4 WEDGE PARALLEL TURNS

A wedge parallel turn has elements of both wedge and parallel turns. The turn is initiated in a wedge and during the turn the skis become parallel. Initially this parallel relationship may happen in the completion phase of the turn but as the skier develops more skills, becomes more confident, skis faster and attempts steeper terrain the skis may become parallel earlier in the turn.

The wedge parallel turn is the step between wedge turns and parallel turns. On steeper terrain or at faster speeds it is difficult to maintain a wedge relationship with the skis because the centre of gravity is more inside the turn and it becomes more natural and easier to ski with the skis parallel. As the path of the centre of gravity moves further inside the turn the edge angle of the inside ski decreases and it becomes easier to rotate this ski to parallel.

Ski/Snow Interaction
• outside ski rotates faster than inside ski during turn initiation to create a wedge
• inside ski rotates quicker than outside ski to create the parallel relationship
• edge angle on the inside ski reduces through the turn until skis are on corresponding edges
• skis are actively edged during the completion phase of the turn to provide increased edge engagement and a stable platform
Movement Focus
- lateral – more active and precise lateral movement to pressure the outside ski is required
- rotational – to create the parallel relationship the inside leg is rotated at a faster rate than the outside leg. To recreate the wedge during the initiation phase of the turn the new outside leg is rotated at a faster rate than the inside leg

Terrain
- ideally will be introduced on green terrain but will progress on to blue terrain as the skill levels of the skiers increase

DEVELOPING A WEDGE PARALLEL TURN
At this level the skier is already displaying the four movements of skiing. To make a wedge parallel turn skiers are going to improve their precision by changing the timing and rate of lateral and rotational movements. Speed and terrain are important tactical factors when developing a wedge parallel turn.

Lateral Movement
As skiers travel faster across the snow in an arc, centripetal force is increased. This creates more force against the outside ski which the skier experiences as pressure, causing them to feel as if they are being pulled to the outside of the turn. With the increase of forces acting on them lateral balance needs to be more precise to allow skiers to balance against the inside edge of the outside ski. As centripetal force increases, the centre of gravity will move more toward the inside of the turn and the upper body will adjust to maintain balance on the edge of the outside ski. The result is that the inside ski has less weight on it than the outside ski and the ski is flat on the snow. The timing of this movement is dependent on the ability of the skier, speed and terrain. The earlier the outside ski is pressured the sooner the skis can become parallel.

It is important to note that the direction of travel of the centre of gravity will always be to the inside of the turn, so if the skier is pressuring the outside ski towards the end of the turn (completion phase) the centre of gravity will have moved up the slope, but for the skier to pressure the outside ski early in the turn (initiation phase) the centre of gravity will have moved down the slope. This also means that the timing of the lateral balance in relation to vertical movement will change. Initially the lateral balance will occur while skiers are flexing but as they develop this will change to balancing laterally while extending.

Rotational Movement
The focus is on the rate and timing of the rotational movement of the inside ski. Both skis are always being rotated through the turn but as the inside ski becomes lighter and flatter, as a result of the centre of gravity moving inside the turn and the outside ski being pressured, it is easier to rotate. An increase of the rate of rotation as the ski flattens will allow the inside ski to become parallel to the outside ski. The skis may become parallel through the control and completion phase of the turn during flexion or they may become parallel through the initiation phase of the turn during extension. The timing of this is dependent on the timing of the pressing of the outside ski.

Progressional Steps
- focus on the precision of lateral balance
- use exercises to develop this
- develop increase in the rate of rotation of the inside leg
- develop with exercises
- adjust the timing of lateral and rotational movements so the parallel relationship can occur earlier in the turn
- ensure appropriate vertical movement to blend lateral and rotational movements
5.5 PARALLEL TURNS

Skiing parallel is more biomechanically natural and comfortable and parallel turns are the goal of many skiers. Parallel turns are created by flattening and steering both skis at the same time during the initiation of the turn. This will allow the skis to maintain a parallel relationship throughout the turn. Once mastered parallel turns open up an increased variety of terrain and turn shape for skiers.

5.5.1 BASIC PARALLEL TURNS

Basic parallel turns are skidded parallel turns; there is not a lot of ski performance.

Ski/Snow Interaction
- skis are parallel throughout the turn
- skis flatten simultaneously at turn initiation
- highest edge angle is created at the beginning of the completion phase

Movement Focus
- lateral – the centre of gravity needs to move above the base of support (perpendicular to the slope angle) to flatten the skis. It is important to aid this with vertical movement
- rotational – to maintain a parallel relationship with the skis both skis need to be rotated when the skis flatten

Terrain
- ideally introduced on easy blue terrain, progressing to all blue terrain
DEVELOPING A BASIC PARALLEL TURN

To develop a basic parallel turn the focus is on the timing of lateral and rotational movements. Rather than moving the base of support away from the centre of gravity to create edge angle as in the wedge parallel the skier will now flatten both skis simultaneously by moving the centre of gravity across the base of support. The flattening is a lateral movement which is aided with good vertical movement at the start of the turn. Once the skis are flattened controlled leg rotation is required to keep the skis parallel as the turning forces are applied.

Lateral Movement
The goal of the lateral movement is to move the centre of gravity from inside the turn to above the base of support. The result will be the simultaneous flattening of the skis on the snow. To move the centre of gravity at the start of the turn, active rolling of the ankles and knees down the hill is required. This will move the hips and upper body above the base of support. It is important to use vertical movement (extension) to aid lateral movement.

Rotational Movement
The goal of the rotational movement is to ensure that the skis stay parallel. This requires a focus on the muscular effort required to turn the skis and the timing and rate of the movement. To keep the skis parallel both skis must be rotated at the same rate and for the same duration.

Progressional Steps
- focus on lateral movement with the goal of flattening both skis
- develop this with exercises
- use vertical movement to aid lateral movement
- focus on rotational movement
- blend movements together

5.5.2  BASIC PARALLEL TURN WITH A POLE TOUCH

A pole touch is a swing of the pole from the wrist and forearm. The tip of the pole touches the snow downhill from the skier during the initiation of the turn. Adding the pole touch to the parallel turn gives skiers some stability at the initiation of the turn and provides some rhythm and flow, allowing them to adapt their turn shape and attempt more challenging terrain.

Ski/Snow Interaction
- pole swing begins at the apex of the turn
- tip of the pole touches the snow as the skis flatten

Movement Focus
The pole swing and touch are not regarded as standalone movements but rather as something that aids the co-ordination of the four movements.

From a movement perspective the pole touch aids:
- rotation – the touching of the pole is a timing cue for the change of direction of rotational movement
- lateral – a well-timed and co-ordinated pole swing and touch will help maintain a stable upper body
- vertical – the timing of the pole swing is co-ordinated with the speed of vertical movement

Progressional Steps
- introduce the pole swing and develop it while stationary
- try pole swing while skiing
- focus on the placement of the pole touch
- focus on the timing of the swing and touch
5.5.3 ADVANCED PARALLEL TURNS

Advanced parallel turns are more dynamic than basic parallel turns. The skis are edged earlier in the turn and the centre of gravity moves further inside the base of support to create earlier edge angle.

**Ski/Snow Interaction**
- skis are edged earlier in the turn
- highest edge angle is achieved towards the end of the control phase
- skis bend more throughout the turn

**Movement Focus**
- lateral – the base of support will travel in a wider arc than the centre of gravity
- rotational – a consistent rate of rotation needs to be applied throughout the turn

Increased speed is an important factor when developing an advanced parallel turn. As the skier travels faster across the snow greater forces are applied, allowing the centre of gravity to move further inside the turn.

During the initiation of the turn the skis begin to travel at a wider arc than the centre of gravity, creating an edge angle at the top of the control phase and a platform for the skier to balance against. Once the platform is created the edge angle can be managed by inclination of the legs.

**Progressional Steps**
- encourage students to ski faster
- focus on a round turn with skis turning at a consistent rate throughout the turn
- develop timing of vertical movements to match slower rate of steering
- develop edging skills through inclination movement of the legs
- focus on a stable upper body as legs incline
5.6 SHORT TURNS

Short turns are turns that are performed in a narrow corridor of between three to four metres. An effective short turn will allow skiers to ski more terrain and varied snow conditions. The main difference between a short turn and a medium turn is the rate at which the movements are made and the centre of gravity will take a more direct line down the mountain.

5.6.1 BASIC SHORT TURN

These are skidded short turns with a focus on an increased rate of rotation of the legs.

Ski/Snow Interaction
- skis turn in within a corridor between three to four metres wide (approximately)
- highest edge angle is at the end of the control phase
- speed is controlled by a combination of skidding and turning (turn shape)

Movement Focus
- rotational – a faster rate of rotation needs to be applied to the skis
- lateral – pressuring and edging the outside ski will provide shape to the turn

The initial focus of the basic short turn is to increase the rate of rotation of the legs. This is easier if the base of support is relatively flat to the snow (low edge angle), making terrain selection an important consideration. A high degree of rotational separation will be evident as the skis are rotated under a stable upper body. It is important to maintain a round turn shape, so even though the rate of rotation has been increased it must be consistent throughout the turn. Inclination of the legs during the initiation of the turn will create edge engagement and help shape the turn through utilisation of ski design.

Other important considerations when developing a basic short turn are
- fore/aft movement – due to the increased rate of rotational movement the angle of the slope changes more rapidly in a short turn than a long turn therefore maintaining centred fore/aft balance is more challenging
- pole touch – a well timed pole touch will aid rhythm and flow. The rate of the pole swing and touch needs to increase to co-ordinate the increased rate of movements

Terrain
- blue groomed terrain that students are comfortable skiing on

Progressional Steps
- introduce increased rate of leg rotation
- isolate and practice this
- introduce lateral movement to create turn shape
- develop rhythm
5.6.2 DYNAMIC SHORT TURNS

Dynamic short turns display ski performance throughout the turn and allow skiers to ski faster while maintaining control. The main differences between a basic short turn and a dynamic short turn are the speed of travel and the range of movement of the centre of gravity. In a dynamic short turn the skier travels at a faster speed allowing the centre of gravity to move further inside the base of support, creating higher edge angle, and more pressure on the ski.

Ski/Snow Interaction
- skis are actively edged at the initiation of the turn
- highest edge angle is achieved in the middle of the control phase (apex of the turn)
- skis bend and ski design is utilised
- tail of ski follows a similar path as the tip of the ski

Movement Focus
- lateral – the centre of gravity needs to move inside the base of support during the initiation phase
- rotational – more muscular effort is required due to the higher edge angle of the skis

Lateral movement in the dynamic short turn focuses on the legs inclining under a stable upper body. The legs incline faster than the upper body resulting in angulation. The focus therefore is more on angulation than inclination. The centre of gravity will not move as far inside the turn as in a dynamic medium turn, because the speed is slower and there is not enough time due to the shortened turn radius, for it to do so.

Terrain
- blue/easy black groomed terrain

Progressional Steps
- focus on the inclining of the legs during transition phase
- encourage a faster rate of travel
- ensure upper body remains stable
- blend vertical movements to aid lateral movement

5.7 DYNAMIC SKIING

Dynamic skiing displays ski performance through increased edge engagement and allows skiers to ski faster while still maintaining control. Ski design is used by tipping the skis on their edges at the initiation of the turn. However it is important to understand that dynamic skiing is the result of accurate co-ordination of the four movements and not simply tipping the skis on their edges and letting the sidecut control the arc of the turn. Controlled leg rotation is still utilised throughout the turn, it is just that this rotation is applied to a ski that is now tipped on its edge. The main difference between an advanced parallel turn and a dynamic parallel turn is that increased speed allows the centre of gravity to move further inside the turn and further away from the base of support.
Ski/Snow Interaction
- skis are actively edged at the initiation of the turn
- highest edge angle is achieved through the middle to second half of the control phase
- greater reaction force from the snow causes skis to bend and therefore ski design is utilised

When developing dynamic skiing the initial focus is on the initiation phase of the turn and working on active edging of the skis. Once this is achieved the next focus is on the control phase and managing (increasing/decreasing or maintaining) the pressure created by tipping the skis on their edges. The completion and initiation phases tend to be blended as speed increases.

Completion/Initiation Phase
As speed is increased in a dynamic parallel turn the initiation phase is more fall line oriented rather than across the hill. The movements of the body required to initiate the new turn start in the completion phase of the old turn. In this phase, while the skis are still turning across the hill, the centre of gravity is beginning to be redirected across the base of support (skis) in the direction of the new turn. This change in timing gives skiers more time to move to the new set of edges, because the initiation of the new turn is happening earlier, and is now blended with the completion of the old turn. The skis will flatten and be tipped on to their new edges as the directional change takes place.

Movement Focus
- lateral – the centre of gravity needs to move towards the base of support earlier in the completion phase to flatten the skis and then inside the base of support during the initiation phase of the turn to create edge angle
- vertical – controlled flexion and extension movements will aid the lateral movement and help with pressure control on the skis
- rotational – continued focus on leg rotation will aid in bringing the path of the centre of gravity back towards the base of support in the completion phase and aid in creating edge and steering angles in the initiation phase
Skiers need to incline at the initiation of the turn in order to get the skis on to the new set of edges. Inclination movements start at the base of support and move up through the body. The amount of inclination will be dictated by speed and the forces acting upon the skier. As speed increases within a given turn radius the centre of gravity is able to move further inside the turn, creating earlier edge engagement. This creates an increase in centripetal force resulting in the skier feeling greater pressure on the outside ski (resultant force).

**Progressional Steps**

- ski students faster
- introduce change of timing of vertical (extension) movement and ensure that the vertical movement is applied with muscular control
- develop movement of the centre of gravity across the base of support with inclination
- develop feeling of increased muscular intensity in rotation as it is applied to an edged ski

**Control Phase**

Increased speed combined with the centre of gravity being further inside the base of support will result in more pressure on the skis in the control phase of the turn. Skiers need to be able to manage this pressure to ski dynamically and maintain control. Managing the pressure will have an effect on how much the skis are bending and, this will also affect turn radius and speed control. Angulation will be developed to accurately control the edge angle and pressure.

**Movement Focus**

- lateral – as the body inclines the centre of gravity moves further inside the base of support, resulting in a higher edge angle. Edge angle continues to increase during the second half of the control phase through movement of the legs creating greater angulation. The higher the edge angle, the greater the reaction force from the snow. This increased pressure causes the ski to bend more and tightens the turn radius
- rotational – an increase in rotational movement of the femurs, creating greater angulation (the knees will appear to have moved sideways) in the control phase will increase the edge angle, tighten the turn radius and increase pressure
- vertical – muscular control of vertical movement allows skiers to manage (increase/decrease or maintain) the pressure on the skis. Slow, controlled flexion and extension movements are essential to achieve pressure management

When developing the control phase of the dynamic turn, pressure must first be developed by an increase in speed, and then controlled by the co-ordination and precision of the movements.

**Progressional Steps**

- develop pressure by skiing faster
- select the appropriate movement for controlling the pressure (lateral, rotational or vertical)
- develop this movement
- blend with the other movements

Managing pressure during the control phase is essential for dynamic skiing