Demonstrate simple canoeing skills

Objectives
On completion of this unit, you should be capable of:
• correctly holding a paddle
• correctly using PFDs
• an understanding of the basic differences between various canoe designs
• demonstrating the relevant paddling skills

Background
Choice of boat
What sort of boat should you paddle? It depends. What sort of paddling do you want to do? The answer to that question will determine the choice of boat, because modern canoes and kayaks are specialised, and none will do everything.

Kayaks derive from the hunting craft of the Arctic. The paddler is seated, and uses a double blade paddle. People in many parts of the world, including Australia, developed canoes with single blade paddles, but Native American birchbark (Têtes de Boule, central Canada) The bark skin was sewn together and sealed with resin. Within the skin were wooden longitudinal splints and ribs. The gunwales and thwarts were lashed together: no nails or screws.

Modern recreational canoes are based on the birchbark craft of North America. When Europeans arrived in North America they adopted the native means of transport for exploration and the fur trade. Factories were set up to build the canoes, with many of them being 10 m or more in length, able to carry a dozen people and a tonne or so of furs and other freight. They were light, and therefore easily portaged, and easily repaired with the materials to hand. Eventually birchbark gave way to canvas.

The originals were paddled from a kneeling position, as are modern competition canoes, but for touring a sitting position is more comfortable.

The low seating position in a kayak gives stability, and decks fore and aft shed water, so that kayaks can withstand wind and wave better than open canoes. Canoes are usually paddled as doubles, and suitable designs are ideal craft for exploring sheltered lakes, creeks and rivers.

Materials
Two types of materials, composites and rotomoulded polyethylene, are the most common in kayak and canoe construction.

Composite materials are a mix of a synthetic resin—polyester, vinyl ester, or epoxy—and a reinforcing fibre—glass, synthetic (e.g. Kevlar®), or carbon. Glass fibre in polyester is the cheapest and most common, and, looked after, will last for many years. Composites of Kevlar and carbon, with epoxy resins, can be lighter and stiffer, but their durability is often questioned.

Rotomoulded boats are formed of polyethylene. For the same stiffness, polyethylene must be thicker than a composite, and the earlier rotomoulded boats were heavier and slower than composite craft. The ad-
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Canoes
Not shown in this set are the Marathon TC1, TC2 and TC4, Flatwater racing C2 and C4, and Whitewater play types.

Touring Canoe
Length 4.5–5.5m

Whitewater touring canoe
Length c 4.5 m

Slalom C1
Length 4 m

Flatwater racing C1
Length 5.2 m
(This boat is to old rules: there is no longer a minimum beam so the diamond shape is disappearing.)

Note: The word ‘Canadian’ has been used in the past to refer to canoes. Australian Canoeing now follows North American practice, and refers to them simply as ‘canoes’.

vantage of polyethylene is that boats made of it bounce off rocks almost undamaged.

Another material is ABS (acrylonitrile-butadiene-styrene), often known by the trade name Royalex™. This tough material is vacuum formed, and the thickness can be varied to give strength where it is needed.

For lightness and performance composite boats have the edge, for the ability to absorb punishment the rotomoulded and ABS boats are the better choice.

Many people like to build their own canoes, and modern epoxy resins make it possible to build light and durable timber craft, either strip-built or plywood. Plans and kits are available.

Design
Other things being equal (which they will not be), a longer boat will be a faster one. On the other hand, the longer the boat, the less manœuvreable it will be. Rocker, the curve of the keel, affects both manouvrability and speed, with more rocker making the boat easier to turn, but slower. Single canoes are usually between 4.5 and 5 m long, doubles 5–6 m. Those designed for flat water have little rocker so that they run reasonably straight, while the whitewater types are rockered for ease of turning among the rocks and eddies.

The beam (width) and cross section affect lateral stability and speed. Wider boats are slower, but more stable. A boat with flat sections amidships will have good initial stability but less secondary stability, i.e. it will feel stable when upright but ‘tippy’ when on edge.

Some flare at bow and stern will help the canoe ride over waves, while tumblehome amidships makes paddling easier by keeping the boat narrower at gunwale level. A high bow and stern may give more lift over waves, but will be blown about by wind, and open canoes are always affected by wind.

All boats must have buoyancy built in. That may be in the form of expanded plastics in bow and stern, or there may be sealed compartments with small access hatches. Open canoes used in
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whitewater are usually fitted with airbags. Some form of secure hand-
hold is needed at bow and stern, usually end loops or toggles. Painters,
ropes about the length of the canoe, are often useful. They are fixed at
bow and stern, and stowed so that they do not trap paddlers (the loops
are too small to pass a whole hand through).

All design is compromise... The diagrams on page 2 give some idea of
the range available. For learning to paddle, the usual choice is a touring
canoe.

Boat setup

Sit or kneel? Sitting is more comfortable for long periods, but kneel-
ning allows more power and is more stable in rough water. Ideally, you
will be able to do both, but this is not possible in some boats. Flat seats,
with the forward edge slightly lower, and ample space beneath are the
best system. Whitewater Skill, Guide and Instructor candidates must
demonstrate the ability to propel a canoe both by sitting and kneeling
and from both bow and stern positions when paddling with a part-
ner in a double.

Flat seats also make it possible to paddle the canoe in either direction—
one way as a double, the other solo—while still keeping the boat in trim.
Offset ‘centre’ thwarts can also be used for paddling doubles solo. The
diagram shows seat and thwart layouts for 4.8 m and 5.5 m craft. The
smaller boat is big enough to paddle as a double, but small enough for
soo use. The longer boat is perhaps too big for easy solo padding.

From whitewater paddling we have the notion of ‘wearing’ the boat, to
the extent of being strapped together. All very well for a run down the
rapid, but not necessary for flatwater paddling. If you will be sitting in
the boat, you will need to set up the footrest if there is one so that the
knees are slightly bent. If you will be kneeling, make sure the pads are
in the right places for your knees.

Other equipment

Paddle

Like boats, paddles come in various shapes
and sizes, and are of various materials. Canoe
paddles have one blade and a T grip or pear
grip.

Traditional canoe paddles are straight, with
flat blades that can be used in either direction.
Marathon canoe paddlers use ‘bent’ paddles,
for the ‘sit and switch’ technique.

Blades may be of composite construction or injection moulded. Cheaper
shafts are of aluminium, with carbon fibre and Kevlar composites
favoured materials for quality shafts. Many paddlers still prefer wooden
paddles.

You may have the paddle in your hands for hours on end, so the lighter
it is, bearing in mind the need to be strong and durable, the better. It
pays to spend a bit more on a quality paddle.

The most accurate means for determining
the correct paddle length is to sit or kneel
as appropriate in the boat: with the top arm
just above horizontal the blade should just
be immersed. Stern paddlers in doubles can use slightly longer paddles, while Marathon
bent paddles can be slightly shorter.

The top hand goes on the T grip, and the
hands should be about elbow width apart.

(Dimensions shown are approximate, and are from end A.)
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Personal Flotation Device
You will need an approved Type 2 or 3 PFD. (The differences relate to safety colours, etc.) It must fit properly and be comfortable. Make sure all zips and buckles are secure, and stay that way.
The PFD will not save your life. It will support you in the water, and also give some protection if you are washed on to rocks.
Pockets are useful for small items when touring, but beware of filling them with heavy and unnecessary items that will get in the way during rescues. A whistle on a cord is a good idea.

Spray deck
Spray decks can be worn for paddling decked whitewater canoes. The two main materials are neoprene and proofed nylon or other synthetic fabric. Neoprene decks seal better, but can be less durable. They would be a better choice for paddling in whitewater, but a nylon deck may be more comfortable in light conditions in hot weather.

Clothing
As in all outdoor activities, you will need to dress for the conditions, and this normally means some kind of layer system. There is a wide range of clothing available, both in design and fabric, and you will need to choose according to the need for sun protection (e.g. Lycra® rash top) or insulation. Modern synthetics give some insulation when wet, and wick moisture away from the skin.
In cool weather you will need a windproof jacket, preferably with good seals at neck and wrists. Avoid cotton.
If you are in doubt, take the pessimistic view and add a layer. On the water, it is usually easier to take off a layer than add one. Carry spare clothing in the boat for when you arrive, or to cover contingencies.

Footwear
You may find yourself walking on sharp rocks, broken shells (or glass) and other uncomfortable surfaces. There is a wide range of wetsuit boots, aquatic sports shoes and sandals available. Old sneakers are often worn, although they tend to be bulky.
Choose something that is comfortable both on the ground (and does not pull off in mud) and in the boat, remembering that straps and laces must not tangle in footrests.

Sun protection
As a paddler, you are very much out in the open, exposed not only to direct radiation but also what is reflected from the water surface.
Long sleeves, long pants, and either a hat with full brim, legionnaire-style cap, or keffiyeh-style headwear, tied on, at the very least.
Sunscreen on all exposed skin, including the lips, reapplied regularly as required. To cover the backs of the hands, fingerless and palmless gloves give protection without affecting paddle feel. Sunglasses to protect the eyes from the UV.

Stowing gear
Clothing, camping gear, food, and other items are carried in waterproof bags or other containers amidships, and perhaps in bow and stern compartments. Various sizes of waterproof bags are available, and you should choose according to the size of your boat and what you need to carry. Generally, several small containers are better than one large one. However, for convenience in handling, and to make recovery after capsize easier, stow small containers in one large easy to seal container such as a waterproof barrel or large dry bag.
You will need to pack according to where you are
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going, the duration of the trip, and so on, with reserves to cover contingencies.

Lighter gear should go in the ends of the boat, heavier items amidships. This means that handling of the boat in waves will be affected less, and stowing heavy items low will aid stability. Packs and barrels should be lashed so that they do not move about and affect trim, and so that they can provide buoyancy if the canoe is swamped. It goes without saying that first aid kits and similar gear will be readily accessible.

Also readily accessible will be map or chart and other navigation items, spare paddle, and so on, all secure. Communications gear is perhaps best in a PFD pocket.

Inspection and maintenance

Before you launch, check that everything is in working order.

After the paddle, wash and clean everything, and make sure that sand and grit have been removed from any moving parts: sliding footrests, and so on. Check that toggle cords and other ropes and cords are not frayed, and moving parts are not excessively worn. Check the paddle, PFD, and all other gear.

If anything didn’t work properly on the water or needs attention, fix it. Store everything appropriately, with the boat under cover.

Paddling

You can be on the water for hours on end: for comfort and safety it pays to have an efficient, relaxed style that maximises power and minimises fatigue, strain and injury. Our understanding of the mechanics and biomechanics of paddling has greatly increased in recent years, thanks to the work of coaches in the competitive disciplines, particularly in flatwater racing. What follows for forward paddling, therefore, is a condensation of the instruction given to sprint and marathon paddlers. If you can arrange it, time spent in a marathon canoe under the watchful eye of a Flatwater Coach will be well repaid. (It will also sharpen your reflexes!)

Correct setup of the boat has already been discussed. Correct ergonomics and posture are essential for paddling. Seated in a canoe you should have a slight forward lean (5–8˚) from the pelvis, back straight without being forced, shoulders ahead of hips, head, neck and shoulders relaxed. The legs are slightly bent, enough that you can’t quite push them straight without moving on the seat.

Lean too far forward and you restrict movement and lung capacity, lean back and again you will restrict movement (and perhaps cause injury).

If you’re kneeling in the canoe your upper body will be as described. You won’t be able to push on a footrest, but the rest of your body can be more flexible, in fact your whole posture can be better.

Where are your most powerful muscles? No, not the arms. In paddling, your arms are little more than the linkage between the power source, the muscles of the body, and the paddle. Your arms are there to put the paddle into the water and take it out again: power comes from body rotation, right from the toes. It’s body rotation that shares the load between the muscles, and smoothly produces more power and length of stroke. That’s true of all strokes.

The ‘paddler’s box’

The shoulder is the joint in the body with the greatest range of movement. It is also the most susceptible to dislocation and other injury.

To reduce the likelihood of injury, and also to develop the most power, the elbows should always be in front of the line of the shoulders. The roughly rectangular volume in which the hands work is called the paddler’s box, and that space rotates with the shoulders. If you want the paddle blade behind you, as in reverse strokes, it means that you rotate the body so that your elbows remain in front of the line of the shoulders.

Several things before you go too far...

Carrying the canoe

The safest way is to have a person at each end, on opposite sides, holding the canoe by bow and stern thwarts or gunwales. Traditionally, canoes were portaged upside-down on the shoulders. Light solo canoes can be carried overhead, with centre thwart or seat across the shoulders. For serious portages yokes, or pads on thwarts, are more comfortable.
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Launching
Put the canoe parallel to the shore, afloat. One paddler steadies the boat while the other embarks, both hands on gunwales, and first foot on the centreline. The first paddler then stabilises the canoe while the second boards. Disembarking reverses the procedure. Solo paddlers have to manage without assistance.

Capsize
Capsizing is part of canoeing, and the sooner you experience a controlled capsize the better. On a course, your instructor will supervise, and will probably have some exercises. If the water is cold, you may want to prepare yourself with a few splashes, and swimming goggles or masks may make things more comfortable.

Keep hold of your paddle and lean to one side or the other until the boat capsizes. When it has stabilised inverted, tuck the paddle under one arm and push yourself clear. If you’re kneeling, slide your legs out from the seat or thwart first.

In a decked canoe, lean forward, grab the spraycover strap and release the spraycover if you’re using one. Put your two hands on the deck behind you, straighten your knees, and, rolling forward, push the boat away from you.

While this is going on, hum a tune to help keep most water out of your nose.

Come up alongside the boat, paddle still under one arm, and take hold of the boat. In a double, check that your partner’s head is above water. Work your way to one end. Let go of anything and it will drift faster than you can swim, so ignore any loose gear for the moment. Either swim the boat ashore, upside-down, keeping to windward of it, or await rescue.

When you capsize unexpectedly remember to follow the appropriate procedure.

Who’s in charge?
Paddling a double canoe is an exercise in cooperation, communication, and coordination. Each paddler must know what the other is doing, and understand how the canoe will react to each stroke. Effective teamwork takes practice.

The stern paddler has a better overview of the boat and its surroundings, and is better able to control its direction with steering strokes. On the other hand, the bow paddler has a better view of nearby obstructions, and is therefore able to warn of them and begin taking action. (In voyageur days bow paddlers were paid more because of their skill and responsibility in reading the water.)

Neither paddler should switch sides indiscriminately: the two should paddle on opposite sides to keep things in balance. They should also synchronise so that the boat moves smoothly. The roles can be listed this way:

Stern
• follow the proper course of the river, by choosing a route with the other paddler
• keep the canoe properly aligned with the current
• maintain spacing with other craft

Bow
• set the pace, the rate of paddling, remembering that the stern paddler will be making correcting strokes, which take longer
• read the immediate route in the river, and warn of obstructions
• decide appropriate strategies and communicate them
• take immediate action, expecting that the stern paddler will follow.

At first most communication will be verbal: with experience paddlers will react to each other’s strokes and the environment. Verbal communication is best as ‘turn left’ or ‘avoid that snag’ rather than naming a stroke: ‘draw’. This helps each other understand where the boat is to go rather than blindly following stroke instructions.

Stern paddlers will need slightly longer straight paddles, while bow paddlers can profitably use paddles with a few degrees of bend.

Solo paddlers have it all to themselves...
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Forward paddling
You want to go places, so forward paddling is the important stroke, and is usually described in three phases.

Catch
The catch is the start of the stroke, the entry of the blade into the water. The key points are:
• clean entry, as far ahead as possible, with the blade as vertical as possible
• full rotation of the torso, bottom hand shoulder forward
• quick development of power

Think about:
• taking the blade to the water: the bottom hand takes the blade to the water in a spearing motion, with the top hand following the shaft movement, but not pushing the blade in
• squaring the blade: the blade must be at right angles to the direction of travel—if the angle is wrong the blade will slide sideways
• burying the blade: completely immerse the blade as quickly as possible, keeping the bottom hand clear of the water throughout the stroke

Power
Think of the blade as being fixed in the water: you pull the boat past it. From the catch, the stroke is ‘taken’ by the whole ‘pulling’ side of the body—toes, leg, hip, torso, and shoulder—all working smoothly together.

The bottom arm remains in a fairly extended position throughout this phase, with the top arm, elbow bent, and hand at around 30–40 cm in front of the head and over the side of the canoe, following the rotation of the shoulders.

Racing paddlers talk of the ‘frame’, the arms and shoulders, remaining fixed through this phase: in other words the elbows are not bending or straightening but remaining at the same angles. The top hand does not push, it follows the shoulders.
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Make sure you paddle parallel to the centreline, not the gunwale. If you’re paddling solo, have the blade as close to the hull as possible: to do that have the top hand right across.

Exit and recovery
The stroke is finished when body rotation is complete. Taking the stroke too far is simply wasted effort. At exit, the blade moves out of the water to the side, with the top hand still high and the bottom elbow bending to lift the blade. That elbow should stay low and relaxed. Take the blade forward for the next stroke, keeping it close to the water surface and flat so it does not catch the wind.

Key points
To revise:
• plant the blade by or ahead of the feet, bottom arm extended but not straight
• rotate the torso to pull back the shoulder and drive the stroke
• the top arm holds its position relative to the shoulders
• the power phase ends with the blade in line with the hips
• lift the blade out sideways
• keep the top hand high, and over the gunwale

Things to avoid:
• excessively long strokes
• punching or dropping the top hand

The canoe will almost certainly wander, usually by turning way from the stern paddler. To keep straight, two corrective strokes for the stern or solo paddler.

Trail stroke
Also known, disparagingly, as the ‘Squaw’ or ‘Goon’ stroke. To make the stroke, let the blade trail at the end of a forward stroke, twist the body to follow it, and apply pressure to the back of the blade. For maximum effect, lever the paddle against the gunwale.

J stroke
So called, because of the path followed by the blade. As the blade passes the thigh, rotate the wrists outwards so that the top thumb points...
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forward. Keep pressure on the drive face of the blade throughout.

There are variations of the stroke. In the older style the paddle did not touch the gunwale, but the modern trend is to lever the paddle off the gunwale to make the pry action more powerful. Practise until you are fluent, and can go straight and turn in either direction under full control.

Switch

Marathon paddlers don’t bother with the J Stroke, but after a few strokes call ‘Hut!’ and swap sides without breaking the rhythm. As you lift the blade from the water, release the top hand. Lift the paddle across the boat and put the top hand beneath the lower hand: the top is now the bottom. Slide the new top hand up the shaft to the handgrip, adjust the bottom hand and make the next stroke.

For touring, change sides every 10–15 minutes.

The solo canoe paddler must be able to J Stroke fluently, and should be proficient on both sides. Some boats are easier to paddle cross wind with the blade on the upwind side, some with it downwind: you’ll need to experiment with your boat.

Reverse paddling

All reverse paddling strokes use the back of the blade and depend, as always, on body rotation for power.

To begin, turn round and with arms straight, put the paddle flat on the water. Keeping the arms straight, twist in the opposite direction, driving the blade towards the bow until it is near vertical. Lift the blade clear and wind up for the next stroke.

When paddling in reverse, the bow paddler will be controlling the direction. Reverse J strokes will be needed. Make the reverse stroke, then as the blade passes the hips, rotate it and pull the top hand across, leveraging off the gunwale.

Emergency stops

Use short, hard, quick reverse strokes when moving forwards, short quick forward strokes when in reverse.

Sweep strokes

Sweep strokes are the main strokes for turning the boat at low speed.

As with other strokes, power comes from the torso muscles, but here the stroke will be a long wide arc, the longer and wider the better. Solo paddlers will make 180° sweeps, but paddlers in doubles must limit their sweeps to 90° as shown on the next page.

For a forward sweep, twist to reach forward and put the blade in as close to the bow as possible or at the 90° position. The lower arm is slightly flexed, the top hand low, just high enough to clear the deck or gunwale. The blade should be completely immersed, just beneath the surface.

Apply power by twisting the body in the opposite direction, keeping shoulder and elbow angles fixed, so that the blade moves (relative to the boat) in a wide arc, either to the stern or the 90° position. While you are learning, watch the blade all the way around so that you develop the full twist necessary.
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The reverse sweep works the same way, but in the opposite direction. Begin by twisting so that the whole paddle is over the side and put the blade in close to the stern or at the 90° position. Now twist the other way to move the blade in a wide arc.

Note that double paddlers will be sweeping in opposite directions: if one is making a forward sweep the other will be making a reverse stroke. The canoe will spin on the spot.

As you develop confidence, look where you are going rather than watching the blade through its arc.

Draw

You may want to go sideways towards or away from a jetty or raft of canoes. The draw stroke is the method.

Begin by twisting the way you want to move. Reach out at right angles with the blade, with the top hand high, and over the side of the boat: the more vertical the paddle the more effective the stroke. Draw the blade towards the boat, but before it reaches the hull lift the wrists to rotate the blade 90°. Slice the blade outwards again for the next stroke. The work is done with the lower arm, with the upper remaining steady.

The solo paddler will control the direction with blade position: towards the bow will turn the boat one way, towards the stern the other. Just right and the canoe will go straight.

Sculling draw

The sculling draw is perhaps the most useful variation for moving sideways, and is a good exercise in understanding and control. The position is similar to that for a normal draw stroke, but the blade is moved fore and aft parallel to the boat, about 25cm from the hull. As the blade changes direction the angle is changed, so that the blade is always ‘climbing’, drawing the boat sideways continuously.

Begin with a small angle, and remember that the blade moves more or less in a straight line, not an arc.
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Pry
This stroke is equivalent to the Draw, but in the opposite direction. (Bow paddlers could use Cross Bow Draw in its place.)

Put the paddle vertically alongside, and hold the shaft against the gunwale. With the blade at 90° to the hull, push the top hand outwards so that the blade is under the hull. Rotate the wrists, and blade, and pull with the top hand. The boat will jerk sideways. Feather the blade and push to swing the blade under the hull for the next stroke. The top hand does all the work, with the lower hand simply holding the shaft in position against the gunwale.

The movement is somewhat jerky. Make a series of short strokes rather than try one long stroke. Coordinate with the Draw at the other end.

Be careful of this one when there are obstructions below the surface, especially when the boat is under way.

Experiment with combinations of Draw/Pry, Pry/Draw, Draw/Draw, Pry/Pry and part sweep strokes to move the boat sideways and/or rotate.

Bow draw
The Bow Draw is used to turn the canoe, by drawing the bow to the paddling side. The stern paddler will usually begin the turn with a forward sweep.

The position is for the beginning of a draw stroke, but lean forward to place the blade well forward. Keep the wrists flexed, and the drive face of the blade facing the bow.

To turn the opposite way, there’s the Overside or Cross Bow Draw. Twist the body and lift the blade across to the other side of the boat. The pressure is still on the drive face of the blade, and control is with blade position and wrist angle. If the blade strikes an obstruction let go immediately with the bottom hand.

Support stroke
This is for those situations when you are about to go in. As with the other strokes, the key is body movement, and certainly not brute force.

The back of the blade is placed on the water, with the shaft low and near horizontal, wrist straight and elbows above the shaft. The boat is righted with hip movement (the 'hip flick’), with the blade on the water simply being something to react against.

Don’t try to lift your head—the natural reaction—but bring it up last: boat first, head last. Drop your wrists to slice the blade up again.
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The solo paddler will normally be able to support on one side only, and will often need to decide before entering some areas of water on which side to paddle for better support. Paddlers in doubles will be able to support on both sides at once.

To practise this, sit comfortably, then lean until the boat becomes unstable, Recover. Try it on the opposite side.

Acknowledgement
This module was written and illustrated by Peter Carter