Diver Propulsion Vehicle

Specialty Course Instructor Guide

Product No. 70238 (Rev. 9/10) Version 2.01

PADI Diver Propulsion Vehicle Specialty Course Instructor Guide

Published and distributed by PADI
30151 Tomas
Rancho Santa Margarita, CA 92688-2125 USA

Printed in U.S.A.
Product No. 70238 (9/10) Version 2.01

Table of Contents

Section One: Course Standards

Section Two: Knowledge Development

Section Three: Open Water Dives

Appendix

Introduction

This section includes suggestions on how to use this guide, an overview of course philosophy and goals, a flow chart to show you how course components and materials work together for success, and ways you can organize and integrate student diver learning.

How to Use this Guide

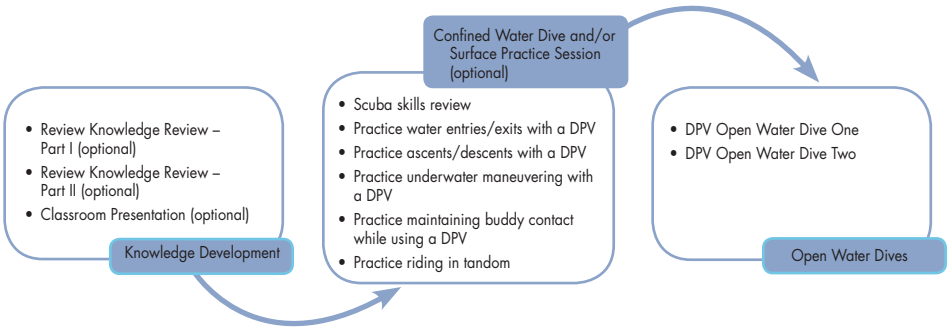
This guide speaks to you, the PADI Diver Propulsion Vehicle (DPV) Specialty Instructor. The guide contains three sections – the first contains standards specific to this course, the second contains knowledge development presentations, the third considers optional confined water and/or surface training and details the open water dives. All required standards, learning objectives, activities, and performance requirements specific to the PADI Diver Propulsion Vehicle (DPV) course appear in **boldface** print. **The boldface assists you in easily identifying those requirements that you must adhere to when you conduct the course.** Items not in boldface print are recommendations for your information and consideration. General course standards applicable to *all* PADI courses are located in the General Standards and Procedures section of your PADI *Instructor Manual.*

Course Philosophy and Goals

Underwater scooters are both *practical* – for a given dive duration, you see a wider area because you travel faster and cover more ground – and it's *fun* – the DPV does much of the work for you; it reduces your exertion and air consumption. In fact, the better DPVs perform the more fun they are and the more useful they are. The only downside to DPVs is that once you start using them, you'll want to have one all the time! Keeping that thought, the philosophy of this course is to focus on *extending the adventure – going further, staying longer, and seeing more – on all your dives with an underwater propulsion vehicle.* Thus, the *goal* of this course is to teach student divers a systematic, methodical approach to enjoying a DPV. Student divers will develop the techniques involved in diving with a DPV within recreational limits and while avoiding disturbing delicate marine life.

The best way to learn underwater scooter procedures and to apply them is by doing it. This *course philosophy* therefore, expands student diver knowledge about choosing the right DPV by looking at types and features, DPV maintenance and transportation, DPV dive planning and safety, and DPV diving procedures. Student divers will also learn how to plan and organize a safe DPV diving experience, the basic techniques of using a DPV, the problems and hazards of diving with a DPV, and how to interact responsibly with the aquatic life they'll see while using a DPV. Student divers will apply the knowledge they gain by reading the PADI *Diver Propulsion Vehicle (DPV) Manual* and watching the companion video with at least two open water dives practicing and demonstrating the practical aspects of diving with an underwater propulsion vehicle.

Course Flow Options



Course Flow Options provides a visual representation of how knowledge development and confined water and/or surface practice sessions support open water dives. When possible, it's preferable to have student divers complete and review Knowledge Reviews from the PADI *Diver Propulsion Vehicle (DPV) Manual* before participating in the open water dives. Knowledge Review – Part I is the same Knowledge Review that appears in the Diver Propulsion Vehicle (DPV) section of *Adventures in Diving*. If you have the first part of the Knowledge Review on file, you may at your discretion, have student divers complete only Knowledge Review – Part II.

Confined water and/or surface practice sessions are not required for the PADI Diver Propulsion Vehicle (DPV) course; however, you may choose to have practical sessions that allow student divers to practice skills such as entries and exists, ascents and descents, and underwater maneuvering with a DPV, as well as riding tandem and maintaining buddy contact while using a DPV.

There are two dives to complete. **You may rearrange skill sequences within each dive; however, the sequence of dives must stay intact.** You may add more dives as necessary to meet student divers' needs. Organize your course to incorporate environment friendly techniques throughout each dive, to accommodate student

diver learning style, logistical needs, and your sequencing preferences. You may choose from one of the approaches from Program Options, or develop your own.

Program Options

Step	Independent Study	Adventure Dive Integration	Instructor-Led
1	Independent study with manual and video (optional)	Independent study with manual and video (optional)	Knowledge Development Classroom Presentation (optional)
2	Review Knowledge Review – Part I and Part II (optional)	Give credit for DPV Adventure Dive and collect Knowledge Review – Part I (optional)	Review Knowledge Review – Part I and Part II (optional)
3	Confined Water Dive and/or Surface Practice Session (optional)	Confined Water Dive and/or Surface Practice Session (optional)	Confined Water Dive and/or Surface Practice Session (optional)
4	Open Water Dive One	Review Knowledge Review – Part II (optional)	Open Water Dive One
5	Open Water Dive Two	Open Water Dive Two	Open Water Dive Two

Section One: Course Standards

This section includes the course standards, recommendations, and suggestions for conducting the PADI Diver Propulsion Vehicle (DPV) course.

Standards at a Glance

Topic	Course Standard
Minimum Instructor Rating	**PADI Diver Propulsion Vehicle (DPV) Specialty Instructor**
Prerequisites **Minimum Age**	**PADI (Junior) Open Water Diver** **12 years**
Ratios	**Open Water 8:1**
Site, Depths, and Hours	**Depth:** 6-18 metres/20-60 feet recommended **18 metres/60 feet maximum depth for training Open Water Divers** **Maximum depth not to exceed 40 metres/130 feet** Hours Recommended: 12 **Minimum Open Water Dives: 2**
Materials and Equipment	Instructor: • **PADI *Diver Propulsion Vehicle (DPV) Course Instructor Guide*** • **Diver propulsion vehicle(s)**

Instructor Prerequisites

To qualify to teach the PADI Diver Propulsion Vehicle (DPV) course, an individual must be a Teaching status PADI Open Water Scuba Instructor or higher. **PADI Instructors may apply for the Diver Propulsion Vehicle (DPV) Specialty Instructor rating after completing a Specialty Instructor Training course with a PADI Course Director, or by providing proof of experience and applying directly to PADI.** For further detail, reference Membership Standards in the General Standards and Procedures section of your PADI *Instructor Manual.*

Student Diver Prerequisites

By the start of the course, a diver must be:

1. **Certified as a PADI (Junior) Open Water Diver or have a qualifying certification from another training organization.** In this case, a qualifying certification is defined as proof of entry-level scuba certification with a minimum of four open water training dives. Verify student diver prerequisite skills and provide remediation as necessary.
2. **At least 12 years.**

Supervision and Ratios

Open Water Dives

A Teaching status PADI Diver Propulsion Vehicle (DPV) Specialty Instructor must be present and in control of all activities. If Dive One is conducted deeper than 18 metres/60 feet, the Specialty Instructor must directly supervise at a ratio of no greater than 8 student divers per instructor (8:1). Otherwise, the Specialty Instructor may *indirectly supervise* all dives. **The Specialty Instructor must ensure that all performance requirements are met.**

The ratio for open water dives is 8 student divers per instructor (8:1), with 4 additional student divers allowed per certified assistant.

Site, Depths, and Hours

Site

Choose sites with conditions and environments suitable for completing requirements. Ideally, select sites familiar to student divers. Shallow dives will provide divers with more opportunities to complete tasks. Use different open water dive sites, if possible, to give student divers experience in dealing with a variety of environmental conditions (incorporate environment friendly techniques throughout each dive) and logistical challenges. Practice skills in confined water sessions first to better prepare divers to apply skills in open water later.

Depths

6-18 metres/20-60 feet recommended

30 metres/100 feet limit for Dive One, with no dive exceeding 40 metres/130 feet.

Hours

The PADI Diver Propulsion Vehicle (DPV) course includes two open water dives, which may be conducted in one day. The minimum number of recommended hours is 12.

Materials and Equipment

Instructor Materials and Equipment

Use the PADI Diver Propulsion Vehicle (DPV) course materials prescriptively to accommodate various sequencing preferences and teaching and learning styles.

Required

- **PADI *Diver Propulsion Vehicle (DPV) Specialty Course Instructor Guide***
- **Specialty equipment needed for student divers to perform DPV dives.**
  - **Diver Propulsion Vehicle** (Although a single DPV is all that is necessary to teach the course, when possible expose student divers to the features and capabilities of an assortment of vehicles.)

Recommended

- PADI *Diver Propulsion Vehicle (DPV) Manual.* Use the student diver manual for detailed content explanation.
- PADI *Diver Propulsion Vehicle (DPV)* video.
- Manufacturer's manual(s) for the DPV(s) used in the course.
- DPV accessories (t-straps/seats, tow straps, clamp on lights, battery chargers, etc.)
- As needed: underwater slates with pencils and Nav-Finder™ etc. for student divers.

Student Diver Materials and Equipment

Recommended

- PADI *Diver Propulsion Vehicle (DPV) Manual*
- PADI *Diver Propulsion Vehicle (DPV)* video
- Access to support equipment as necessary, including but not limited to: underwater diver propulsion vehicle (DPV), DPV accessories, underwater slates with pencils, and Nav-Finder etc.

Assessment Standards

To assess knowledge you may review the Knowledge Reviews from the student diver's manual with the diver. **The student diver must demonstrate accurate and adequate knowledge during the open water dives and must perform all skills (procedures and motor skills) fluidly, with little difficulty, in a manner that demonstrates minimal or no stress.**

Certification Requirements and Procedures

Document student diver training by completing the PADI *Specialty Training Record* for Diver Propulsion Vehicle (DPV) (see Appendix). **To qualify for certification, by completion of the course, student divers must complete *all* performance requirements for Diver Propulsion Vehicle (DPV) Open Water Dives One and Two. The instructor certifying the student diver must ensure that all certification requirements have been met.** Reference Administrative Procedures of the General Standards and Procedures section of your PADI *Instructor Manual* for detailed information on Referral.

Links to Other Courses

The Diver Propulsion Vehicle (DPV) Adventure Dive conducted during the PADI Adventures in Diving program may count as the *first dive* toward this specialty at your discretion.

Similarly, divers who successfully complete Diver Propulsion Vehicle (DPV) Open Water Dive One and Knowledge Review Part 1 may receive credit as an Adventure Dive toward the PADI Adventure Diver and the PADI Advanced Open Water Diver certifications. They may also credit the specialty certification toward the PADI Master Scuba Diver rating.

Section Two:
Knowledge Development
Conduct

Warning! – once you use a DPV you'll be hooked! With this I mind, the philosophy of this course is to focus on extending the adventure – going further, staying longer, and seeing more – on all your dives with an underwater propulsion vehicle. This means to show student divers what to consider when choosing the right DPV by looking at types and features, how to maintain and transport their DPV, how to plan and organize a safe DPV diving experience, and basic DPV techniques. Also, help student divers identify any potential problems and hazards of diving with a DPV, and how to interact responsibly with the aquatic life they'll see while using a DPV.

Student divers complete independent study of the course by reading the PADI *Diver Propulsion Vehicle (DPV) Manual* and by watching the PADI *Diver Propulsion Vehicle (DPV)* video. Work hand-in-hand with the student diver manual to address prescriptively student diver misconceptions or for clarification on certain points of interest. If there is a need for instructor-led presentations, use the following teaching outline, which appears in point form, as a road map of the conduct, content, sequence and structure for the PADI Diver Propulsion Vehicle (DPV) course.

The result should be student divers with theoretical knowledge and pragmatic experience who can adapt what they've learned to future underwater dive propulsion vehicle opportunities. **Regardless of how you conduct knowledge development (independent study, instructor-led or a combination of these instructional approaches), student divers will be able to explain the following learning objectives.**

Knowledge Development

Learning Objectives

By the end of knowledge development, student divers will be able to explain:

Reasons why people use DPVs; important component, feature, and battery information regarding DPV selection.

- **What are the three main advantages of a DPV?**
- **What are the three basic types of DPVs available on the market?**
- **What are the five basic components of all DPVs?**
- **What eleven features should you look for when selecting a DPV?**
- **What are the common battery types used in DPVs, and what are the advantages and disadvantages of each?**

DPV setup, maintenance, battery care, and transportation.

- **What do you need to do to keep a DPV in working order?**
- **What seven safety precautions apply to working with DPV batteries?**
- **What nine ways can you maximize battery performance?**
- **How do you transport a DPV by air?**

The basic techniques of using a DPV; DPV dive planning considerations and safety; handling DPV problems.

- **How do you determine a *turnaround point* when using a DPV?**
- **How do you descend and ascend properly with a DPV?**
- **Why do you need extra vigilance to monitor depth when using a DPV?**
- **What buddy team considerations do you have when making a DPV dive?**
- **How do you avoid propeller entanglements and obstructions when using a DPV?**
- **What are the four guidelines for courteous and environmentally responsible DPV use?**
- **What should you do if your DPV fails during a dive?**
- **How do you handle a runaway DPV?**
- **What do you do in an out-of-air emergency when DPV diving?**

Diving your DPV – step by step.

- **What are the basic predive preparations for a DPV?**
- **What entry considerations (boat and shore) apply to DPV use?**
- **How do you use a DPV at the surface, and/or while snorkeling?**

- **How do you generally use a DPV underwater?**
- **How do you steer a DPV?**
- **How do you use a DPV for tandem riding?**
- **What exit considerations (boat and shore) apply to DPV use?**
- **What are the basic post-dive steps for a DPV?**

Knowledge Development Teaching Outline

Suggestions to *you,* the PADI Diver Propulsion Vehicle (DPV) Specialty Course Instructor, *appear in note boxes.*

A. Course Introduction

1. Staff and student diver introductions

Note:
Introduce yourself and assistants. Explain your background with DPV diving if your student divers are not familiar with you.

Have divers introduce themselves and explain why they are interested in DPV diving. Break the ice and encourage a relaxed atmosphere.

Give times, dates and locations as appropriate for classroom presentations, confined water and/or surface practice sessions, and open water dives.

Review with student divers other skills they'll want as a PADI DPV Diver. *These opportunities, through additional specialty course training, may include, but are not limited to: PADI* Enriched Air Diver, *PADI* Deep Diver, *PADI* Peak Performance Buoyancy Diver, *PADI* Dry Suit Diver, *PADI* Search and Recovery Diver *and PADI* TecRec.

2. Course goals -this course will help:
    a. Develop your practical knowledge of underwater diver propulsion vehicles.
    b. Increase your diving skills.
    c. You plan, organize, and make DPV dives.
    d. Improve your diving ability and provide you with additional supervised experience.
    e. Encourage you to participate in other specialty training.
3. Course overview
    a. Classroom presentations and confined water and/or surface practice sessions.

b. Open water dives. There will be at least two open water dives.

4. Certification
   a. Upon successfully completing the course, you will receive the PADI Diver Propulsion Vehicle (DPV) Specialty certification.
   b. Certification means that you will be qualified to:
      1. Plan, organize, make, and log open water DPV dives in conditions generally comparable to or better than, those in which you are trained.
      2. Apply for the Master Scuba Diver rating if you are a PADI Advanced Open Water Diver and a PADI Rescue Diver (or qualifying certification from another training organization) with certification in four other PADI Specialty ratings, and you have 50-logged dives.

Note:
Use the PADI Student Record File. *Explain all course costs and materials, and what the costs do and do not include, including equipment use, dive site fees, etc. Explain what equipment student divers must have for the course, and what you will provide. Cover and review points about scheduling and attendance.*

5. Class requirements
   a. Complete paperwork.
   b. Course costs.
   c. Equipment needs.
   d. Schedule and attendance.

B. Why use a DPV?

- ***What are the three main advantages of a DPV?***

1. Fun, discovery, and ease are the main advantages of using a DPV:
   a. Fun is probably the most common motivation for buying and learning to use a DPV.
   b. With a DPV, you can explore a significantly larger area during a single dive.
   c. Using a DPV dramatically reduces exertion and air consumption. In addition, for divers with limited mobility, using a DPV may be the difference between being able to dive and not being able to dive.

C. DPV Overview and Selection

- ***What are the three basic types of DPVs available on the market?***

Note:
Provide student divers access to different types of DPVs and the manufacturers' literature. If possible, distribute copies of manufacturers' literature to student divers. Most manufacturers are often happy to provide additional information upon request.

Advise student divers that DPV service is very important and recommend they purchase their DPV through a local PADI Dive Center or Resort.

1. Types of Diver Vehicles
    a. Many DPVs are a combination of the types listed below. Most DPVs are pull types that tow you via handles and/or a tow strap. A few models are push types that attach to your cylinder, and some tec models combine into large sleds.
        1. Compact: small, lightweight, inexpensive, but not fast. They mainly reduce effort but are not especially thrilling to ride; swimming speed or slightly faster. Their small size makes them easy for travel. Compact DPVs help you save air and stay down longer. Less expensive, compact DPVs are an affordable solution for individuals with budget restrictions.
        2. Recreational: modest run time, easily maneuverable, fast and fun to ride. These mainstream DPVs are relatively light and compact, but a bit heavy for a long walk. Their typical speed is 2-5 kph/1-3 mph.
        3. Technical: are often faster and run longer than recreational models. They have a very rugged construction, are rated for tec diving depths, tend to be large and heavy, and require transportation for anything but a very short walk. Their typical speed is 2-5 kph/1-3 mph.

- ***What are the five basic components of all DPVs?***

2. Features Common to all Vehicles – trigger or thrust control, propeller and housing, handles, battery access, and buoyancy characteristics.

a. Thrust control/trigger mechanism – to run the scooter you squeeze a trigger or thrust control usually located on one of the handles. Many DPVs have a trigger lock or a cotter pin you should use to keep from accidentally activating the propeller.

b. Propeller and housing – the housing protects the propeller from damage and also protects you from the propeller.

Note:
Remind student divers that although DPVs are not as powerful as an outboard motor, to treat their propellers as potentially hazardous. Advise divers to keep hands, gear, and all objects well clear of DPV propellers.

c. Handles – most have two tow/steering grips, and a carrying handle.

d. Battery access – to recharge your DPV batteries. Most commonly, you open the scooter and remove the battery to charge it, but some models have a small port you open to plug in your charger.

e. Buoyancy characteristics – the vast majority are designed to be approximately neutral, that is they are slightly negatively buoyant in fresh water and positively buoyant in salt water. Weights can be added or removed to some DPVs.

f. Regardless of your DPV's buoyancy characteristics, you should weight properly and control your buoyancy. Don't use your scooter as a substitute for good buoyancy.

3. Accessories – All DPVs have accessories that range from required through highly desirable to purely optional. Some models include all the accessories available and others have optional accessories. Besides the accessories we'll discuss shortly, some DPVs come with air pumps, special marker systems, floats and mounting plates for still or video camera housings.

a. Battery charger – these nearly always come with the DPV. Most chargers are battery specific, so you should only use the supplied charger to recharge your DPV batteries.

b. Lights – though they're not as common as you might think. Lights drain the battery, which most divers would rather save for running the motor. Some scooters have external lights you can attach.

c. Lanyard or nose clip – allows you to attach your DPV to your weight belt or a BCD D-ring. A wrist lanyard is useful for times when you just want to let go of your scooter for a few moments, whereas a clip on or near the nose is usually the best place to tow the scooter.

d. T-bar, tow strap or other attachment – allows you to ride without your arms taking all the strain. A T-bar is a bar attached to a strap that you slip between your legs as a straddled seat. A tow strap clips to your BCD, typically to a scooter ring located just below the center buckle. When using tow straps and T-bars, keep two points in mind:

   1. If your scooter floods it can become very negatively buoyant, so you need to be able to release the strap.
   2. These straps easily tangle in the DPV propeller if you try to ride without clipping or mounting the strap. Either have the strap in its proper place when you ride, or have some means for bundling and securing it out of the way.

Note:
Remind student divers that if a crotch strap is added; remember to put a weight belt on after putting on their scuba unit so the crotch strap doesn't trap it.

Suggest to student divers that a prudent precaution when using tow straps is to have shears or a knife that may be used to cut away the strap if necessary.

e. Transportation case – often your scooter comes packaged with the case as standard. Transportation cases are useful for traveling, especially if you plan to travel with your DPV by air.

- ***What eleven features should you look for when selecting a DPV?***

4. Features to consider when choosing a DPV – no one scooter meets all needs and preferences, so your choice will be a balance of cost and the following features:

   a. Rugged construction – DPVs can be particularly susceptible to damage because they have moving parts, seals, and electronic components.

   b. Seal(s) – because every seal is a potential leak and something else that needs either long term (factory) or short term (user) maintenance, the fewer seals the better.

   c. Warranty/servicing – like your regulator, BCD and other gear, your DPV will need service by a trained technician periodically. Choose a model and make that your local PADI Dive Center or Resort can service.

d. Battery type: run time and recharge time – the battery will determine how much run time you get from a single charge, and how long it takes to recharge.

e. Variable speed – is highly desirable so you and your buddy can adjust your DPVs to cruise at the same pace. This makes it easier to stay together.

f. Maximum depth capability – be sure your DPV choice is designed for the depths at which you plan to use it.

g. On/Off switch type – it's highly desirable to choose a DPV with a trigger that has some kind of locking system. This is important so your DPV doesn't accidentally start running at an inopportune time, which can cause injury, entangle something in the prop or simply run your battery dead without you realizing it. Locking devices range from switches to clip pins that insert into the trigger to immobilize it.

h. Handle design – handle design is important for comfort. You need to be comfortable hanging on and/or steering for extended periods, and have comfortable access to the trigger while doing so.

i. Buoyancy characteristics – Although being slightly negative or positive won't affect a scooter's performance significantly, it will affect whether you can leave it resting on the bottom or floating on a line behind the boat. Some models allow you to adjust the buoyancy by adding or removing weights.

j. Weight out of water – weight and performance are the primary trades when you choose a DPV. Consider how far you have to move your DPV to get to the boat or the water's edge and back, and whether you need a dolly, hand truck or a buddy, and so on for your diving needs.

k. Accessories – consider the accessories different DPVs have and use them to narrow down your selection to a final choice.

Note:
The snorkel is an important but often overlooked DPV accessory. Remind student divers that snorkels are not optional when using a DPV, in fact they'll probably use a snorkel more often because it's easy to accidentally end up with a long swim from the boat or shore if their DPV fails.

5. The models of DPVs you'll use in this course are:

> ***Note:***
> *Prepare your notes with accurate information from DPV manufacturers for your local area in the instructor outline below. Depending upon course requirements, you may also consider having student divers research this information for a home-study assignment. Regardless of your instructional approach, review with student divers the models of DPVs they'll use in this course (whether the DPVs are provided by yourself or by student divers).*

a. Models:

_____
_____
_____
_____
_____

b. Speed and duration:

_____
_____
_____
_____
_____

c. Controls:

_____
_____
_____
_____
_____

d. Assembly/disassembly procedures:

_____
_____
_____
_____
_____

e. Battery charging procedures:

_____
_____
_____
_____
_____

f. Accessories:

_____
_____
_____
_____
_____

g. Manufacturer's recommendations/procedures for maintenance and warnings or suggestions that appear in the owner's manual:

_____
_____
_____
_____
_____

- ***What are the common battery types used in DPVs, and what are the advantages and disadvantages of each?***

5. Common battery types – there are three primary battery types used in modern DPVs: lead acid (liquid or gel cell), Nickel cadmium (NiCad), and Nickel Metal Hydride (NiMH):

   a. Lead acid rechargeable batteries are built using old, yet proven technology that has several advantages over even the latest NiMH technical developments. The original lead acid batteries, like those found in automobiles, were filled with liquid acid.

      Advantages:

      1. Relatively low cost
      2. You can partially recharge without a memory loss effect.
      3. Recharges easily – takes on more power from a short partial recharge (such as between dives) than other types of batteries

      Disadvantages:

      1. Heaviest batteries
      2. Liquid types restricted for air travel
      3. Lead acid batteries are damaged by being deeply discharged

   b. NiCad is a solid cell rechargeable battery that has been used for many years. However, the NiMH is replacing NiCad, because the cadmium in NiCad is a heavy metal toxic to people and the environment.

      Advantages:

      1. High power to weight ratio – a given weight battery holds more power than an equal weight lead acid battery.
      2. No issue with air transportation

Disadvantages:

1. Must be fully discharged before recharging to avoid developing a memory loss effect.
2. Are toxic to people and the environment when disposed of and require special handling for disposal and recycling.
3. A high output until nearly drained – you don't get much warning when power falls off, the batteries are about gone.

c. NiMH is a solid cell rechargeable with virtually no memory effect and is less harmful to the environment at disposal.

Advantages:

1. High power to weight ratio – they have the lightest weight and most compact size of all batteries commonly used in scooters.
2. No issue with air transportation
3. No memory issues – you can recharge partially discharged batteries without fully discharging them first.

Disadvantages:

1. Higher initial cost
2. You may have to cycle (charge and fully discharge) a brand new NiMH battery a few times before it holds a full charge.
3. Damaged by disuse – you must recharge monthly even when not used.

D. DPV Setup, Maintenance, Battery Care, and Transportation

- ***What do you need to do to keep a DPV in working order?***

1. DPV Setup and post-dive care – your DPV is a modest investment, so before using it for the first time, it's important to know the basics of DPV set up and care.
   a. Set up your DPV according to manufacturer's guidelines. These vary, but watch for these common points:
      1. Clean and lubricate all user-accessible o-rings – failure to do this is the most common cause of DPV leaks. Some models use compression o-rings, which should be cleaned, but not lubricated. Be sure to follow the manufacturer's instructions.
      2. Use freshly charged batteries
      3. Some DPVs have small ports you remove to recharge batteries and/or to release to allow batteries to vent hydrogen gas. Be sure to replace the port before diving or immersing the unit.

4. After assembly, test operation – be sure your feet, hands and all objects are clear of the propeller, and briefly pull the trigger. Check that the propeller turns in the correct direction. Do not run for more than a quick check – most DPVs are not designed for continuous out of water operation.
5. On a boat, secure DPVs so they don't tumble or roll. Doing so can damage the DPV and can injure people. Store it out of the sun, or cover it with a light covered towel if that's not possible.

b. The first post-dive care step for your scooter is rinsing with fresh water. Immerse your unit in fresh water and agitate for 2-3 minutes and run it for one or two short bursts if possible (may not be due to size). If you can't immerse the unit, rinse it very thoroughly with running water.

c. After rinsing, dry and open your DPV to recharge the batteries as soon as possible.

d. Store the DPV according to manufacturer guidelines. Generally:

1. Store disassembled as appropriate for your DPV according to the manufacturer guidelines.
2. Some units do not disassemble except for charging the port plug. Store with the plug out.
3. Store out of the sun in a cool, dry place.

- ***What seven safety precautions apply to working with DPV batteries?***

2. Battery use and care

a. Use only the battery charger provided by or specified by the manufacturer. The wrong charger (even same voltage) can damage the battery and/or the charger and could cause a fire.

b. When charging batteries, first connect the battery to the charger, and then plug the charger in. After recharging, first unplug the charger, and then disconnect the battery from the charger.

c. Charge lead acid batteries in an upright position.

d. Do not smoke or allow open flames near charging batteries, and never charge in an unventilated area.

e. Be careful to connect battery terminals to the correct charger terminals. Charging with a reverse connection can ruin the battery, the charger, and risk a fire.

f. Do not place the battery into the vehicle for at least 30 minutes after charging, or longer if specified by the manufacturer. Battery charging generates hydrogen gas, which must be allowed to vent off before placing it into the vehicle.

g. When travelling, make sure your charger is compatible with the local current.

- ***What nine ways can you maximize battery performance?***

3. To maximize battery power and extend its usable life:

   a. Follow manufacturer's recommendations with respect to battery charging and care. Doing so is the first step in getting the most out of your DPV battery.

   b. Avoid completely discharging the battery, especially lead-acid. When you notice a significant drop off in power, discontinue use until you can recharge it.

   c. Recharge the batteries within 24 hours of use. Delays in recharging can damage a battery.

   d. Recharge NiCad and NiMH batteries completely.

   e. Be prepared to replace the battery after approximately 1000 charges.

   f. Prolong the life of both the batteries and charger by charging in a cool area (10-27°C/50-80°F). Heat shortens the life of the batteries and charger.

   g. Charge batteries in a warm area – you don't want it too cool any more than you want too hot. Charging times increase as temperatures decrease.

   h. Protect your battery and charger from water and sea spray. Always recharge in a dry, protected environment.

   i. Recharge batteries periodically when not used. Some newer batteries need attention when not used for long periods. NiMH batteries and lead acid batteries should be charged monthly if not used.

- ***How do you transport a DPV by air?***

4. Air travel – some considerations

   a. The normal procedure is to transport the battery within the DPV. Disconnect the battery so the DPV cannot accidentally activate.

   b. If you cannot disconnect or remove the batteries, be sure to lock the trigger and use tape to hold the lock in place.

   c. Use manufacturer's carrying bag or container

d. Pad the DPV with foam or other protective material.

e. Assume the DPV will probably have to be carried as checked baggage; be prepared for excess baggage fees due to weight or baggage restrictions. Fees can be substantial so it may be worth shipping your DPV to your dive destination.

f. Be prepared to explain what it is and what it's used for, especially internationally. A good tip is to pack a copy of the instruction manual with the manufacturer's website listed with your scooter.

g. Some batteries may not be transported by air (not an issue with modern NiMH batteries).

E. Dive Planning Considerations

- ***How do you determine a* turnaround point *when using a DPV?***

1. When using a DPV you must consider battery endurance in addition to the typical dive planning criteria such as time, depth limits, and air consumption.

   a. When possible, start each dive with a fully charged battery. If you can't (such as during repetitive diving when it's impractical to recharge between dives), plan DPV dives to stay well within swimming distance of the exit point.

   b. To maximize battery endurance, use the slowest speed appropriate for the dive plan.

2. Determining the turnaround point

   a. Without a DPV, you normally plan your turnaround point based on the amount of air and/or no decompression time remaining that is required to return to the exit.

   b. When using a DPV, your turnaround point often depends on battery power rather than air supply. However, you cannot ignore air supply considerations. Abnormally high air consumption rates or very high capacity batteries may mean that air, not battery power, will remain the limiting factor.

   c. Monitor battery usage to ensure that you maintain sufficient power, with a reserve, to return to your exit point. This is important because many DPVs do not have battery power indicators, and it's the user's responsibility to keep track of the time the unit is in use.

   d. A good guideline when using a DPV is the rule of thirds – 1/3 air/power to reach destination, 1/3 to return, 1/3 for reserve. This rule is mandatory in most forms of tec diving with a DPV.

e. Never go farther from your exit point than you can swim back towing the DPV. It's best to plot a circle or semicircle within swimming distance of the exit point. Use the DPV to see more area in detail rather than to go farther from the exit point.

f. Don't ignore your air supply and no stop time, because these may limit you before battery power does.

g. Plan repetitive dives by subtracting the run time from previous dives from the total time. Divide the remainder by three to get your turnaround time.

Note:
Review with student divers how to calculate the turnaround time for a repetitive dive by using the rule of thirds. For example, subtract the total run time from the first dive from your test time, and then divide that by three to get your rule of thirds. Suppose you used 15 of your 20 allowable minutes going out and10 coming back (because the current was helping) for total run time of 25 minutes. One hour minus 25 minutes leaves 35 minutes, which (rounding down to the closest number evenly divisible by three) gives 11 minutes out, 11 minutes back, and 11 minutes reserve.

h. Since it's nearly impossible to determine by how much a partial recharge increases your scooter's run time, it's best to disregard it and let it add to your reserve margin.

- ***How do you descend and ascend properly with a DPV? Why do you need extra vigilance to monitor depth when using a DPV?***

3. Depth and descent/ascent considerations

a. Depth changes can occur rapidly when using a DPV, so use caution when making descents and ascents. It is recommend that DPVs not be used for these maneuvers.

b. When using a DPV during your descent/ascent, do so gradually – at a gently sloping angle to avoid equalization and potential lung expansion problems.

c. Never exceed a descent rate at which you can equalize comfortably and never exceed an ascent rate of 18 metres/60 feet per minute, or slower if specified by your dive computer.

d. In most situations, it's easier to hold or clip off your scooter and descend or ascend conventionally down a line. When you hover near the bottom or reach the surface, deploy your DPV for horizontal travel.

e. A common situation is to descend on a gradual slope under power, return to the mooring/ anchor line, clip off the scooter and make a conventional ascent and safety stop along the line.

f. Your DPV descend and ascend procedures should always be part of your dive plan.

- ***What buddy team considerations do you have when making a DPV dive?***

4. If you and your buddies don't pay attention to staying together, using DPVs can separate you very quickly. The usual practice is for one diver to lead with the other buddies following either single file or in a V formation.

   a. Generally, it's advantageous for each diver to have a DPV. Your dive plan should account for whether you each have your own, or whether you're going to share one.

      1. A large capacity DPV may allow one diver to tow another. This may work for short distances, towing for long distances may tire the towed diver.

      2. Towing two divers reduces the DPV's range.

      3. Buddies using DPVs must be careful to maintain visual contact; it's very easy for divers to separate quickly. A leader/follower system works well, with the slower DPV/ diver leading.

   b. When using DPVs with variable speed, you can usually fine-tune your speeds so they match.

   c. Be careful around your buddy and other divers using DPVs. Although speeds aren't great, a diver and vehicle have a lot of mass, and impacts have the potential for injury.

- ***How do you avoid propeller entanglements and obstructions when using a DPV?***

5. Avoiding propeller entanglements and obstructions

   a. One of the most common problems DPV divers experience is entanglement of equipment in propellers.

   b. To avoid entanglement, as always, streamline your equipment keeping all buckles, lanyards, hoses or other items firmly secured.

c. Obstructing water flow into or from the propeller reduces the DPV's effectiveness. Ride the unit as prescribed by the manufacturer.

d. Keep alternate air sources away from the propeller, and monitor them to be sure they don't free flow while riding. Many DPV divers prefer adjustable second stages for alternate air sources to reduce free flowing while riding.

e. Be careful when maneuvering around areas with heavy aquatic vegetation. Avoid using the DPV while on the surface when in kelp beds, water hyacinth or other vegetation with thick matting.

- ***What are the four guidelines for courteous and environmentally responsible DPV use?***

6. Diver etiquette and environmental responsibility – inconsiderate individuals have caused some dive operators to ban DPVs from their boats, and others greatly restrict their use.

   a. Be courteous to other divers. Other divers might not particularly like the sound and vibration of a DPV, especially when it scares away the critters they like to watch or photograph. Be considerate, use basic common sense and you'll have other divers wishing they were scootering with you instead of wishing you were scootering on the other side of the world.

Note:
Review with student divers Project AWARE Foundation's "Ten Ways a Diver Can Protect the Underwater Environment." *Remind divers that they can download a pdf of this information from http://www.projectaware.org/americas/english/pdfs/AW_TenWays.pdf .*

Ten Ways a Diver Can Protect the Underwater Environment

1. Dive carefully to protect fragile aquatic ecosystems

Many aquatic organisms are delicate and can be harmed by the bump of a camera, the swipe of a fin or even the gentle touch of a hand. Some aquatic organisms like corals grow very slowly and breaking even a small piece can destroy decades of growth. By being careful you can prevent long-term damage to magnificent dive sites.

2. Be aware of your body and equipment placement when diving

Keep your gauges and alternate air source secured so they don't drag over the reef or other vital habitat. Control your buoyancy, taking care not to touch fragile organisms with your body or equipment. You can do your part and prevent injury to aquatic life every time you dive.

3. Keep your dive skills sharp through continuing education

Before heading to open water seek bottom time with a certified professional in a pool or other environment that won't be damaged. You can also refresh your skills and knowledge with a PADI Scuba Review, PADI Advanced Open Water Diver course or Project AWARE Specialty course such as Peak Performance Buoyancy.

4. Consider how your interactions affect aquatic life

Avoid touching, handling, feeding or riding on aquatic life. These actions may stress the animal, interrupt feeding and mating behavior or provoke aggressive behavior in normally nonaggressive species.

5. Understand and respect underwater life

Playing with animals or using them as food for other species can leave a trail of destruction, disrupt local ecosystems and rob other divers of their experiences with these creatures. Consider enrolling in a PADI Underwater Naturalist, AWARE Fish Identification or Coral Reef Conservation Specialty course to better understand sustainable interactions.

6. Be an ecotourist

Make informed decisions when selecting a destination and choose Project AWARE Environmental Operators or other facilities dedicated to sustainable business practices. Obey all local laws and regulations and understand your effect on the environment. Don't collect souvenirs like corals or shells. Instead, take underwater photos and follow Project AWARE's 10 Tips for Underwater Photographers.

7. Respect underwater cultural heritage

Divers are privileged to access dive sites that are part of our cultural heritage and maritime history. Wrecks can also serve as important habitats for fish and other aquatic

life. Help preserve these sites for future generations by obeying local laws, diving responsibly and treating wrecks with respect.

8. Report environmental disturbances or destruction

As a diver, you're in a unique position to monitor the health of local waters. If you notice unusual depletion of aquatic life, injury to aquatic animals or strange substances in the water, report these observations to responsible authorities in your area.

9. Be a role model for other divers and nondivers when interacting with the environment

As a diver, you see the underwater results of carelessness and neglect. Set a good example in your own interactions so that others can learn from you.

10. Get involved in local environmental activities and issues

You can greatly affect your corner of the planet. There are plenty of opportunities to support healthy aquatic environments including Project AWARE conservation and data collection activities like local beach and underwater cleanups and CoralWatch monitoring, supporting environmental legislative issues, attending public hearings on local water resources, conserving water or making responsible seafood choices.

b. When riding, be cautious around aquatic organisms and shipwrecks, just as you would without a DPV. Keep plenty of space between you and the reef or the shipwreck you're exploring. When riding, be very aware of the environment that surrounds you, just as you would be without a DPV.

c. Pay attention to your fin tips so you don't accidentally drag or kick anything with your fins. You and your buddy should always plan your DPV dive paying close attention to the environmentally friendly techniques you will use to avoid disturbance and damage to aquatic life.

d. Avoid touching and disturbing the bottom. Silt decreases visibility and harms aquatic life, particularly corals. It can also clog and damage the propeller.

F. Handling DPV Problems

- ***What should you do if your DPV fails during a dive?***

1. Vehicle failure – There are three problems involving scooters that you should be prepared to handle. One and two – a failed scooter and a run-away scooter – result from a problem with your DPV itself. The last – an out-of-air emergency – may be made complicated by a scooter if you're not prepared.
    a. Mechanical problems such as flooding or unexpected drain on battery power may result in vehicle failure. This requires towing the unit back to the exit point.
        1. A small lift bag helps keep the vehicle neutrally buoyant and avoids overexertion caused by dragging a slightly negative object over a long distance.
        2. If your buddy has a functioning DPV, the diver with the disabled vehicle may be able to ride tandem back to the exit point. (In tec diving, it is mandatory for each diver to have a DPV.)
            a. Team should head immediately for exit point rather than continuing the dive.
            b. By doing this, even if the second DPV runs out of power before getting there, neither diver has as far to swim.
            c. The towed diver should tuck in tightly behind the driving diver and avoid trying to see. This minimizes drag to maximize the speed and range of the remaining DPV.
            d. It is common to have a clip on the nose of a DPV that you can attach to a BCD D-ring at the waist level. This lets you hang onto your buddy with both hands and the scooter rides cleanly (this may not work with a flooded scooter that's no longer near-neutral buoyancy).
        3. In extreme situations, such as in strong or other adverse conditions, you may need to abandon the DPV to assure your safety. Some divers carry a marker buoy they can deploy to increase the chance of recovery should this happen.

- ***How do you handle a runaway DPV?***

2. Runaway scooters are less likely than a scooter failure.
   a. A potential, though extremely unlikely, problem is the inability to turn off the DPV motor. This usually results from a failure of the speed control switch. Some DPVs – particularly tec models – are designed to fail in the "on" position so you can use them to return to your exit point.
   b. Methods for stopping a runaway motor
      1. Aside from immediately returning to your exit point and ending the dive, the first option is to put the nose of the vehicle into the bottom while avoiding damaging aquatic life. You may be able to clear a jammed trigger, or failing that, wait for the battery to run down. This is less damaging, but may take awhile. Don't use this technique if it would cause you to descend rapidly or exceed your planned maximum depth. In some cases, you may be able to hold the nose against another firm object until the motor runs down.
      2. Some models have a secondary release mechanism to disengage the trigger to stop a runaway.
      3. As a last resort, foul or block the propeller with a rigid object that can withstand the impact (not your console!). Note that some DPV props tend to expel obstructions with force, so do this with caution. Better than a rigid object, use a glove or a piece of rope. This will normally stop only the propeller – the motor may continue running until the battery power dissipates. If possible, keep your DPV immersed until the battery runs down to provide cooling. Alternatively, retrieve it from the water, then quickly dry it, open it and disconnect the battery. Fouling or blocking the propeller usually damages the drive connections, and may damage the propeller. It may also burn out the motor. NEVER use a piece of vital equipment such as a gauge console to jam the propeller.
      4. Some scooters have variable pitch propellers. These are often designed to allow you to place your hand flat on the variable pitch knob while the motor runs causing the pitch of the propeller to change to "slow." Once the pitch is in "slow" the scooter should be very easy to manage but if all forward motion is required to cease, use one of the other techniques for stopping it.
      5. Let it go. In most cases, you'll be able to recover it. However, if you can't, no equipment, no matter how costly, is more important than your safety and health.
   c. Should a runaway occur, do not use the DPV again until it is properly serviced.

Note:
Advise student divers that runaway situations can happen with perfectly working scooters. This occurs when a DPV diver generously offers a first-timer a chance to drive a scooter. Since the first-timer is not oriented to the workings of the DPV, they are unable to stop because they don't know that grabbing the handle is also squeezing the trigger. Suggest to divers that there's nothing wrong with letting people give your scooter a go, but don't do it unplanned. Show them how to operate it, and be sure to caution them about descent and ascent rates. Show them how to keep their gear and hands out of the prop. Have them circle within your easy reach and stay at the same depth, and it will be a lot of fun with no unpleasant surprises.

- ***What do you do in an out-of-air emergency when DPV diving?***

3. Out-of-air emergencies
    a. The priority is getting air to the out-of-air diver. Share air with your alternate air source and ascend.
    b. If necessary, abandon the DPVs.
    c. If the donor has ample air and both divers remain calm, it may be reasonable to retain the DPVs and ascend towing (not riding) them. This may be important if the emergency occurs a long way from the boat or shore because it will reduce the effort of the surface swim.
    d. If scootering a long way on the surface, switch to your snorkel. Deploy a surface marker buoy (SMB) if there is a lot of boat traffic to make sure you're visible.

G. Diving with a DPV – Step by Step

- ***What are the basic predive preparations for a DPV?***

1. Predive preparation
    a. Make sure the battery is adequately charged as per manufacturer instructions.
    b. Prepare seals and seats.
    c. Assemble unit – make sure latches are fastened.
    d. Examine unit carefully – especially propeller.
    e. Test unit for 10 seconds or less (longer may cause damage). Any irregular noise could indicate a damaged propeller shaft seal.

f. Be careful not to place anything into propeller shroud (protective covering) while propeller is spinning.

g. Lock the trigger and store unit out of the sun.

- ***What entry considerations (boat and shore) apply to DPV use?***

2. Entry considerations

   a. From shore

      1. If diving from a dock, secure the DPV in the water first, and then gear up, get in and head off on your scooter.
      2. If wading through shallow water or mild surf, hold the vehicle in a way that you cannot accidentally engage the throttle. Use the trigger lock if it has one.
      3. Do not operate the DPV until you are in water deep enough for it to tow you without obstruction with the bottom. On a flat, open bottom, this is usually water approximately chest-deep.
      4. When using the vehicle at the surface, keep the propeller shroud (protective covering) well below water level to prevent cavitations (vibrations or uncontrolled movement in the water caused by a swiftly moving propeller) and loss of thrust. A partly submerged propeller causes unbalanced resistance and can cause severe vibration, leakage or damage to the propeller shaft bearing.
      5. You may want to carry a larger DPV to the water or secure it in the water, conditions permitting, before fully gearing up and getting in yourself.

   b. Boat entry

      1. Except for very small, light models, don't enter the water while holding a DPV, because this can cause injury to you or damage to the vehicle.
      2. Have someone hand the DPV to you after entry. (Be sure to instruct the assistant on how to handle the vehicle properly.)
      3. An alternate method is to put your DPV on a gear line in the water before entry, then retrieve the vehicle after entry. Use the tether for exiting the water without assistance, too. On charter boats, inform crew of the tether so they can check to be sure it's up before moving the boat.

- ***How do you use a DPV at the surface, and/or while snorkeling?***

3. DPV use at the surface
    a. Operating techniques
        1. Keep your vehicle parallel to your body with arms bent slightly at the elbows. Keep your fins straight.
        2. Don't hold your vehicle too close to your body. This may prevent effective water flow through the propeller, reducing efficiency and thrust.
        3. Equipment streamlining is especially important when using a DPV. Make sure equipment doesn't foul the propeller or snag on sensitive aquatic organisms. Be especially careful with hoses and equipment secured to your BCD via lanyards or hooks. (Equipment streamlining is especially important when using a DPV.)
        4. Use accessory brackets to attach cameras to the DPV, or clip the camera to the BCD well away from the DPV. Unsecured cameras can easily tangle in the propeller. Avoid trying to operate a DPV and a camera at the same time.
        5. Be sure you're visible to boaters. Use a bright colored hood, Colorful DPV, inflatable signal tube or other means to be sure boaters know you're there.
    b. Snorkeling under power
        1. To conserve power, begin kicking before starting your vehicle.
        2. Adjust speed to a comfortable rate.
        3. Avoid turning your head abruptly to the side because this can flood or dislodge mask.
        4. A snorkel that provides minimum drag will shake less while cruising.

- ***How do you generally use a DPV underwater?***

4. DPV use underwater
    a. If used, clip on the tow strap or straddle its bar. Adjust the length so your arms are ahead of you but not quite fully extended, so that the strain is on the strap and your arms primarily steer.
    b. Position yourself to ride level with the DPV low so the prop wash flows under you (except models that attach to your cylinder). You should not feel the prop wash.
    c. Depending on the DPV model, you can ride partially or entirely on top behind or above the scooter.

d. Be sure to control your buoyancy and trim so you ride smooth and level and pause after each depth change to ensure that you are neutrally buoyant.

e. Adjust your speed to a comfortable rate. Once you and your buddies start scootering, you may need to pause to fine tune your speeds so they match. If you can't match speeds, the usual procedure is to let the diver with the slower scooter lead so you don't leave your buddy behind by accident.

f. With higher speed scooters, you may want to avoid turning your head abruptly to the side because this can flood or dislodge your mask.

g. Normally you just ride a scooter, but you can add speed by kicking while scootering. This may be useful when it is necessary to pair someone with a slower compact scooter with someone on a faster recreational scooter.

- ***How do you steer a DPV?***

5. Steering a DPV is intuitive

   a. Pivot turns: To make a quick turn, hold the vehicle further away from your body (if not using a tow strap) and point in the desired direction using fins for trim.

   b. Banking turns: To make a slow turn, roll your body slightly (30º-40º) and lift the nose. This puts you into a sweeping arc in the desired direction; use your fins for trim.

   c. With a tow strap, turns are a bit like riding a bicycle; as you go, you steer the handles in the desired direction and lean/bank naturally.

Note:
Discuss with student divers that it is common to cruise with their DPV until they see something of interest. Remind divers that most scooters are weighted to be slightly negatively buoyant, though some are neutral and others are positively buoyant. If your scooter's negatively buoyant and there's no current, set it down on the sand or some other place devoid of sensitive aquatic life. If your DPV floats or hovers, you need to anchor it to something. Most of the time, the best anchor is you: clip it by the nose to a waist level D-ring. Whatever you do, don't simply let it go or you may spend the rest of the dive trying to find it.

- ***How do you use a DPV for tandem riding?***

6. Riding tandem
    a. Riding tandem increases power drain, but is a useful technique for transporting divers to and from the dive area, or for exploring a large area within swimming distance of the exit. It is also useful if you and your buddy have your own DPVs, but one malfunctions.
    b. The two most common techniques are for the rider to grasp the pilot's ankles or to hold on to the pilot's cylinder valve. To minimize drag, the rider should stay squarely behind the pilot and avoid peeking ahead. Tandem riding is much less tiring and much easier to control when the pilot has a tow strap.
    c. Rider and pilot should agree on a communication system to use during tandem operation. This usually consists of taps, tugs or squeezes by the rider, since the pilot can stop to communicate.

- ***What exit considerations (boat and shore) apply to DPV use?***

7. Exit procedures
    a. Shore exit: Hold the vehicle in a manner that will not accidentally engage power as you exit the water. Use the trigger lock if you can. You may want to secure a larger DPV in the water or just out of the water, conditions permitting, and then get out of your gear before retrieving it.
    b. Boat exit: Hand your vehicle to someone already aboard (explain how to avoid activating the motor) or tether your unit before exiting. Make sure your vehicle is pulled out of the water immediately after your exit. In some instances, vessels have gotten underway with forgotten DPVs still attached to tether lines.

- ***What are the basic post-dive steps for a DPV?***

8. Post-dive procedures
    a. Secure the DPV in a low traffic area, out of direct sunlight, where it is safe from people and equipment. If you're on a boat, be sure to stow it as soon as possible.
    b. Rinse thoroughly with fresh water and dry it before opening it to recharge the batteries.
    c. Recharge the batteries and store your scooter per manufacturer instructions.

Section Three:
Open Water Dives
Conduct

There are no required confined water and/or surface practice sessions for the PADI Diver Propulsion Vehicle (DPV) Specialty Diver course, however, it is sound instruction to develop student diver abilities in conditions that don't add complexity to learning new skills. For example, you may have student divers practice effective water entries and exits with a DPV, practice descents, maneuvering with, and ascents with a DPV or other underwater DPV skills before progressing to more challenging conditions. Some of the underwater skills, such as maintaining proper buddy contact, proper body position, snorkeling under power and riding tandem with a buddy, are much easier to learn if you have student divers practice them in a confined water session first. You may add confined water and/or surface practice sessions at your discretion. The confined water session may also include a scuba skills review. After completing the course, suggest to divers to dry-rehearse predive preparation, maintaining proper buddy contact, descending, maneuvering with, and ascending with a DPV before using an underwater vehicle on a dive.

On the first dive, student divers mainly acquaint themselves with the operation of a DPV by demonstrating an effective water entry, by making a proper descent, by maneuvering underwater, and by making a proper ascent and water exit with a DPV. On the second dive, student divers independently plan and execute a dive using a DPV according to procedures and safety guidelines, and apply their knowledge learned from the course to operate a DPV while riding in tandem with a buddy exhibiting both piloting and passenger skill. Bottom time on each dive should not exceed the no decompression limits of the Recreational Dive Planner or each diver's computer, if used. **Regardless of how you conduct the open water dives, student divers must demonstrate the following performance requirements to qualify for certification.**

Open Water Dives

Performance Requirements

By the end of the open water dives, student divers will be able to:

Diver Propulsion Vehicle (DPV) Open Water Dive One

- **Demonstrate the appropriate predive preparation of the DPV used in the course.**
- **Demonstrate an effective water entry with a DPV for the conditions present.**
- **Demonstrate how to operate a DPV while at the surface, including proper body position, preventing clogging the propeller, snorkeling under power, and riding in tandem with a buddy.**
- **Demonstrate how to make a proper descent with a DPV.**
- **Demonstrate underwater maneuvering, including a straight and steady course while gradually changing depth, and making pivot and banking turns.**
- **Demonstrate the ability to maintain proper buddy contact while using a DPV.**
- **Demonstrate the ability to follow the safety guidelines and recommendations previously discussed while using a DPV.**
- **Demonstrate how to make a proper ascent and exit the water when using a DPV based on the conditions present.**
- **Demonstrate the proper post-dive maintenance of the DPV used in the course.**

Diver Propulsion Vehicle (DPV) Open Water Dive Two

- **Demonstrate the ability to independently plan and execute a dive using a DPV according to the procedures and safety guidelines provided in the course.**
- **Demonstrate how to operate a DVP while riding in tandem with a buddy exhibiting both piloting and passenger skill.**

Open Water Guidelines for Diver Propulsion Vehicle (DPV)

A. General Open Water Considerations

1. Involve student divers in dive-planning activities. Have student divers prepare their DPVs and determine their turnaround points.
2. Conduct a thorough briefing. The better the briefing, the more smoothly the DPV dives will proceed. Besides discussing the conditions and the facilities at the dive site, predive briefings should cover entry and exit techniques and locations, and surface and underwater DPV techniques.
3. The use of certified assistants is highly recommended. Assistants can help track buddy teams and watch student divers waiting to complete an exercise with the instructor. An assistant at the surface can help with check in, check out procedures, and be prepared to help in an emergency.
4. When possible, demonstrate all techniques and allow ample time for student diver practice. Encourage student divers to experiment with various speed settings. Highlight techniques important to responsible environmental interactions and emphasize proper body positioning that minimizes drag and is less fatiguing, allowing longer operating times.
5. If the dive site lacks much bottom contour, consider constructing an underwater obstacle course using lines and floats. This not only heightens student diver interest, but also gives them a reference and feedback on their maneuvering performance.

B. Diver Propulsion Vehicle (DPV) Open Water Dives

Dive One

- ***Demonstrate the appropriate predive preparation of the DPV used in the course.***
- ***Demonstrate an effective water entry with a DPV for the conditions present.***
- ***Demonstrate how to operate a DPV while at the surface, including proper body position, preventing clogging the propeller, snorkeling under power, and riding in tandem with a buddy.***
- ***Demonstrate how to make a proper descent with a DPV.***
- ***Demonstrate underwater maneuvering, including a straight and steady course while gradually changing depth, and making pivot and banking turns.***
- ***Demonstrate the ability to maintain proper buddy contact while using a DPV.***
- ***Demonstrate the ability to follow the safety guidelines and recommendations previously discussed while using a DPV.***
- ***Demonstrate how to make a proper ascent and exit the water when using a DPV based on the conditions present.***
- ***Demonstrate the proper post-dive maintenance of the DPV used in the course.***

a. Briefing

1. Dive sequence – review Dive One tasks

b. Predive procedures

c. Dive One Tasks

1. Predive preparation: If there has been a significant time delay since classroom training was completed, review all relevant pre-dive procedures to ensure that student diver DPVs are in proper working order.

2. Water entry and exit: Highlight to student divers to hold the DPV in a way that the throttle control can't be accidently engaged. If diving from a boat, remind student divers to either tether the DPV in the water before entry/exit, or to have someone hand it down/up to them after entry/exit.

3. Descents and ascents: Emphasize that descending quickly under power isn't advised because it makes equalizing difficult and has the potential to cause injury. Stress that the most effective descent/ascent control is to hold the DPV and make the descent/ascent in a normal (nonDPV) manner.
4. Surface DPV operation: Remind student divers to maintain a streamline body position, not to hold the DPV too close to their body, to be mindful of equipment entanglement, and to secure accessory equipment to their BCD or DPV via lanyards or clips. Repeat the caution of not turning their head abruptly while snorkeling with the DPV.
5. Underwater DPV operation: Encourage student divers to maintain steady level riding, to make banking turns, pivot turns, and to change depths gradually. When riding, remind student divers to be cautious around fragile aquatic life, just as they would without a DPV.
6. Buddy contact: Encourage divers to maintain visual contact with each other while maintaining a safe distance.

d. Post-dive procedures

e. Debriefing

1. Encourage student divers to discuss the techniques they used to enter and exit the water, their DPV use at the surface, how they descended and ascended with their DPVs, their operating techniques and how they managed a steady, level ride, pivot turns, banking turns, and depth change maneuvers underwater. Ask student divers how they dealt with buddy communication. Guide discussions to address what worked, what didn't work, and how things may be done differently the next time. Ask student divers to point out any possible hazards. Talk about the interesting scenery, reefs, or wrecks seen on the dive and the special considerations the student divers have taken to avoid any accidental damage.

f. Log dive (instructor signs log)

Dive Two

- ***Demonstrate the ability to independently plan and execute a dive using a DPV according to the procedures and safety guidelines provided in the course.***
- ***Demonstrate how to operate a DPV while riding in tandem with a buddy exhibiting both piloting and passenger skill.***

a. Briefing

1. Dive sequence – review Dive Two tasks

b. Predive procedures

c. Dive Two Tasks

1. Encourage student divers to apply the knowledge and skills they have learned about DPVs to plan and conduct the dive and to prepare their vehicle.
2. Use a single DPV for two divers. Have an agreed upon communication system (a system of taps) before riding tandem.

d. Post-dive procedures

e. Debriefing

1. Encourage student divers to discuss their dive plans and their tandem riding. Guide discussions to address what worked, what didn't work, and how things may be done differently the next time. Review the techniques they used to enter and exit the water, their tandem DPV use at the surface, how they descended and ascended with their DPVs, their operating techniques and how they managed a steady, level ride, pivot turns, banking turns, and depth change maneuvers underwater while riding tandem. If diving at a site different from dive one, ask student divers about possible hazards and how they may be avoided. Talk about the aquatic marine life and any interesting scenery, reefs, wrecks seen on the dive.

f. Log dive (instructor signs log)

Appendix

Table of Contents

Diver Propulsion Vehicle (DPV)
Knowledge Review Part I Answer Key

Note:
To assess knowledge you may review the Knowledge Review from the student diver's manual with the diver, ideally prior to participating in skill practice. Prescriptively teach answers to questions student divers may have missed or have answered incorrectly or incompletely. Ensure student divers understand what they have missed

1. List two advantages of using a DPV.
   1. *You can explore a significantly larger area in greater detail during a single dive.*
   2. *DPVs reduce exertion and air consumption.*

2. What are five features common to all DPVs?
   1. *Thrust control/trigger mechanism*
   2. *Propeller and housing*
   3. *Handles*
   4. *Battery access*
   5. *Buoyancy characteristics*

3. Explain why it is important to secure the DPV when traveling by boat.
   If the DPV slides or rolls, this could damage the unit, other equipment or cause injury.

4. What is a good guideline when using battery power or air supply to determine a turnaround point for the dive?
   The rule of thirds — 1/3 air/power to reach your destination, 1/3 to return and 1/3 for reserve.

5. True or False. In extreme situations, you may need to abandon your DPV.
   True

6. True or False. When using a DPV, a diver should never exceed an ascent rate of 18 metres/60 feet per minute.
   True

7. List two suggestions/recommendations for avoiding propeller entanglements and obstructions.
   1. *Keep all buckles, lanyards, hoses and other equipment firmly secured and away from the propeller.*
   2. *Be careful when maneuvering around areas with heavy aquatic vegetation.*

8. True or False. Riding tandem while diving with a DPV is neither a common nor acceptable procedure.
   False

9. Explain the procedures for entries from shore when using a DPV.
   Hold the vehicle in a way that the throttle control cannot be accidentally engaged. Do not operate vehicle until you are in the water deep enough for it to tow you without obstruction from the bottom (usually about chest deep). Be sure to keep propeller shroud (protective covering) completely below the surface of the water to prevent cavitations.

10. What are four things a diver can do to avoid damaging the environment when using a DPV?
    1. *Plan your DPV dive paying particular attention to the environmentally friendly techniques you will use to avoid disturbance and damage to aquatic life.*
    2. *Always keep plenty of space between you and the wall, the bottom or the shipwreck.*
    3. *Be aware of your fin position at all times so that you don't drag or kick anything with your fins.*
    4. *Avoid touching and disturbing the bottom. Silt decreases visibility and harms aquatic life, particularly the corals. It can also clog and damage the propeller.*

Adventure Dive: Diver Propulsion Vehicle (DPV)

Skills Overview

- Knowledge Review
- Briefing
- Equipment preparation
- Predive Safety Check
- Appropriate entry with DPV
- DPV use at surface
- Appropriate descent with DPV
- Riding steady and level
- Adjusting depth
- Turning
- Tandem riding
- Parking
- Towing a DPV
- Underwater tour
- Appropriate ascent with DPV
- Appropriate exit with DPV
- Post-dive procedures
- Debrief
- Log Dive – Complete Adventure Dive Training Record

Diver Propulsion Vehicle (DPV)
Knowledge Review Part II Answer Key

Note:
To assess knowledge you may review the Knowledge Review from the student diver's manual with the diver, ideally prior to participating in skill practice. Prescriptively teach answers to questions student divers may have missed or have answered incorrectly or incompletely. Ensure student divers understand what they have missed.

11. In addition to following the manufacturers' recommendations, what are three common procedures to maximize battery performance and life?
    1. *After use, keep a slight charge in the battery – do not completely discharge.*
    2. *Charge battery within 24 hours of use.*
    3. *Always recharge battery completely.*

12. List seven battery safety tips.
    1. *Use only the battery charger provided/specified by the manufacturer.*
    2. *After charging, first unplug AC line, then disconnect the battery charging connector.*
    3. *Keep the battery in an upright position while being charged.*
    4. *Do not put the battery in your vehicle for at least 30 minutes after charging, or longer if specified by the manufacturer.*
    5. *Do not smoke or allow an open flame near the battery and never charge in an unventilated area.*
    6. *When traveling, make sure your charger is compatible with the local current.*
    7. *Be careful not to connect terminals to the wrong leads.*

13. True or False. When storing a diver propulsion vehicle one should store the unit with the locking buckles fastened and the battery connector plug plugged into the motor.
    False

14. List at least three basic steps for properly maintaining a DPV?
    1. *Rinse with fresh water after diving.*
    2. *Run motor in fresh water.*
    3. *Perform standard o-ring maintenance.*
    4. *Charge battery.*

15. Briefly describe three methods to handle a runaway motor.
    1. *If you are near the bottom put the nose of the vehicle into the bottom (avoiding aquatic life).*
    2. *Foul the propeller with a rigid object, glove or piece of rope. (Do not use vital equipment such as a console.)*
    3. *Let it go.*

16. How should you approach depth changes, descents and ascents when using a DPV?
    Slowly and cautiously

17. List six steps to prepare the DPV for use.
    1. *Make sure the battery is adequately charged.*
    2. *Prepare seals and seats.*
    3. *Assemble unit (Make sure latches are fastened.)*
    4. *Examine the unit.*
    5. *Test unit for 10 seconds or less (longer may cause damage). Any irregular noise could indicate a problem.*
    6. *Keep the unit out of the sun.*

18. Why is equipment streamlining important when using a DPV?
    Streamlining increases efficiency and reduces drag. In addition, it avoids equipment entanglements in the propeller.

19. Describe a pivot turn.
    To make a quick turn, hold the vehicle further away from your body and point it in the desired direction using fins for trim.

20. Describe the easiest way to exit on to a boat with a DPV.
    Hand the vehicle to someone already aboard (explain how to avoid activating the motor) or tether your unit before exiting. (Make sure your vehicle is pulled out of the water immediately after your exit.)

PADI Adventure Dive Training Record
Adventure Dive:
Diver Propulsion Vehicle (DPV)

Skills Overview

- Knowledge Review
- Briefing
- DPV and equipment prep
- Predive Safety Check (BWRAF)
- Appropriate entry with DPV
- DPV use at surface
- Appropriate descent with DPV
- DPV use underwater
- Adjusting depth and turning
- Tandem riding
- Parking and towing a DPV
- Underwater tour
- Appropriate ascent with DPV – Safety Stop
- Appropriate exit with DPV
- Debrief and post-dive procedures
- Log Dive – Complete Adventure Dive Training Record

Instructor Statement

"I verify that this student diver has satisfactorily completed the Knowledge Review and Performance Requirements (as described in PADI's Adventures in Diving Program Instructor Guide) for this PADI Adventure Dive. I am a renewed, Teaching status PADI Instructor for the current year."

Instructor Name: _____

Instructor Signature: _____

PADI #: _____ Completion Date: _____
Day/Month/Year

Instructor Contact Information (Please Print)

Instructor Mailing Address: _____

City: _____ State/Province: _____

Country: _____ Zip/Postal Code: _____

Phone/Fax/email: _____

Student Diver Statement

"I verify that I have completed all of the Performance Requirements for this Adventure Dive. I realize that there is more to learn about diving with a Diver Propulsion Vehicle (DPV) and that completion of a PADI Diver Propulsion Vehicle (DPV) course is highly recommended. I also agree to abide by PADI Standard Safe Diving Practices."

Student Diver Signature _____ Date: _____
Day/Month/Year

PADI Specialty Training Record
Diver Propulsion Vehicle (DPV)

Instructor Statement

"I verify that this student diver has satisfactorily completed all academic and/or any confined water training sessions as outlined in the PADI Specialty Course Instructor Guide for Diver Propulsion Vehicle (DPV). I am a renewed, Teaching status PADI Instructor in this specialty."

Instructor Name: _____ PADI #:_____

Instructor Signature: _____ Completion Date: _____
Day/Month/Year

Open Water Dives

Dive One

I verify that this student diver has satisfactorily completed Dive One as outlined in the PADI standardized guide for Diver Propulsion Vehicle (DPV), including:

- Preparation and post-dive maintenance of a DPV
- Effective entry and exit, as well as descents and ascents, with a DPV
- Operation of a DPV on the surface
- Operation and maneuvering a DPV underwater while maintaining buddy contact

I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name: _____ PADI #:_____

Instructor Signature: _____ Completion Date: _____
Day/Month/Year

Dive Two

I verify that this student diver has satisfactorily completed Dive Two as outlined in the PADI standardized guide for Diver Propulsion Vehicle (DPV), including:

- Planning and executing a dive using a DPV following appropriate procedures and safety guidelines

I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name: _____ PADI #:_____

Instructor Signature: _____ Completion Date: _____
Day/Month/Year

Student Diver Statement

"I verify that I have completed all performance requirements for this Diver Propulsion Vehicle (DPV) specialty. I am adequately prepared to dive in areas and under conditions similar to those in which I was trained. I agree to abide by PADI Standard Safe Diving Practices."

Student Diver Name: _____

Student Diver Signature: _____ Date: _____
Day/Month/Year