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Additional Lesson Plans and Fact Sheets to aid in Archery Instruction can be found on the Georgia 4-H S.A.F.E. Website at:

<http://www.georgia4h.org/safe/disciplines/archery.htm>

- *Eye Dominance Fact Sheets*
- *Glossary of Shooting Sports Terms*
- *Making D-Loops*
- *Target Stand Plans*
- *Sample Score Cards for 4-H Events*
- *Competition Guidelines (Rules) for 4-H Indoor and Out Door Archery Events*

Using the Basic Archery Lesson Plans

Ronald A. Howard Jr. *

Archery involves a fascinating group of sports for people of all ages. The fundamentals are simple. The requirements are few. A new archer can be shooting fairly well within a short time, if he or she has the benefit of a planned approach to developing the basics of form.

The lessons outlined in this section of the 4-H *Shooting Sports Guide* cover the basics of archery. They present the beginning archer with a broad, sound foundation for learning the discipline and enjoying archery over a lifetime. Many approaches have been used to teach archery. Some are effective; others interfere with learning. The approach in these lessons has proven successful with young people and adults across the country. The lessons are my own, but no lesson plan springs from a vacuum. The ideas, efforts and assistance of many other people contributed to their current form. Jim Mackey introduced me to good archery form and tutored my early development. Lloyd Brown and Charlie Kroll had strong influences during the regional shooting sports workshops, as did every instructor, neophyte or tournament archer who participated. The Old Bowhunter, Bill Wadsworth, and many colleagues in bow hunter education developed, talked through or demonstrated many of the techniques and approaches used. Hundreds of young people were test cases without knowing their contribution. Numerous publications also had an influence. Some are cited as references; others remain anonymous building blocks of thought, style or philosophy.

Archery Marksmanship and Safety

These lessons form the fundamental core of basic archery marksmanship instruction. The safety section may be shortened if the young people are already familiar with shooting safety. Only the safety considerations of archery equipment and shooting may need to be covered. The sequence of the first four lessons, however, was carefully and deliberately chosen to maximize learning and minimize the risk of developing form faults. Avoid the temptation to jump directly to sight shooting with compound bows. Instinctive shooting with light (15-to 25-pound draw weight) re-curve bows optimizes shooting form development, so good shooting principles are best established in that context. Note the value of repetition in several of the lessons. Try to avoid rushing the learner through development of their basic skills. The repetition is helpful.

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If you have lesson plans that have proven themselves effective, use this series only to make a good thing better. If not, try this sequence as a means of introducing kids to archery. This portion of the material (safety, basic archery form, instinctive shooting and sight shooting) should be an absolute minimum of instruction for all beginning archers. It may prove to be a helpful review for those with more experience.

Understanding Archery Equipment And Competitive Events

The lessons on the compound bow, bow tuning and making archery equipment are taught as part of the basic core by some instructors. Others reserve them for slightly more advanced participants.

Shooting compound bows allows the archer to shoot a heavier bow with faster arrows. The higher efficiency and engineered advantages with heavy draw weights have made compound bows extremely popular with bow hunters. Target archers also have discovered those advantages. Aside from the additional tuning and safety considerations for compound bows, the fundamentals of good shooting remain the same.

Bow tuning and equipment making sessions are excellent programs for rainy or cold weather lessons when an indoor activity is needed. The skills involved increase the ability and satisfaction of the archer. In addition, the items may be exhibited by the participants.

The archery game lesson introduces a few of the target shooting games available to the archer. The lesson exposes young people to the games through classroom activity or field experience. Young people may find their interests are broadened by discovering FITA (Olympic-style shooting), USAA, NFAA, IBO or other types of formal target events. Target games that keep the learning *fun* keep interest high for young people. They have great value to the leader, coach or instructor. Clout shooting and flight shooting take advantage of the beginning archer's urge to see how far an arrow will go. Shooting flying targets with flu-flu arrows attracts attention and interest. Add your ideas to make the shooting exciting and fun. Those elements are vital to continued success.

Bowhunting

The subject matter covered in the bow hunting series is complex and sometimes demanding. Like the other archery disciplines, bowhunting depends on developing fundamental skills before applying them to a discipline. Ethical considerations and values education are focal points of bowhunting instruction. Bow hunting introduces a number of additional needs, responsibilities and skills for the archer. The standards in bow hunter education are set by the National Bow hunter Education Program (NBEP), developed by the National Bowhunter Education Foundation. These lessons draw strongly on that program. Many states, provinces and several other countries have adopted that instruction as the basis for

certification programs in bowhunting. Normally that requires at least 8 to 10 hours of instruction by qualified instructors. The 4-H Shooting Sports Program endorses this established program, just as it endorses the use of state hunter education programs. Interested and qualified leaders are strongly encouraged to become certified as NBEP instructors through their state coordinators. An excellent instructional outline is available through NBEP, but this guide outlines lessons to be presented in a series of short 4-H club meetings.

Fundamentals of Archery Marksmanship and Safety

- Basic Archery Lesson 1- Archery Equipment, Safety and Range Commands
- Basic Archery Lesson 2 - Developing Proper Archery Shooting Form
- Basic Archery Lesson 3 - Instinctive Shooting With a High Anchor
- Basic Archery Lesson 4 - Shooting With Sights

Understanding Archery Equipment and Competitive Events

- Basic Archery Lesson 5 - Shooting Compound Bows
- Basic Archery Lesson 6 - Making Archery Equipment
- Basic Archery Lesson 7 - Bow Tuning
- Basic Archery Lesson 8 - Target Archery Games

Archery Equipment, Safety and Range Commands

Ronald A. Howard Jr.*

Objectives

Participating young people and adults will:

1. Become familiar with the history of archery.
2. Understand the basic rules of safe archery shooting.
3. Recognize and understand the range commands being used in the program.
4. Recognize and demonstrate various pieces of archery tackle and their parts.
5. Determine eye dominance.
6. Learn how to select an appropriate bow.
7. Learn how to string and unstring a recurve bow properly.
8. Have fun while learning.

Roles for Teen and Junior Leaders

- Present portions of the lesson.
- Lead demonstrations.
- Tutor or quiz participants on identifying equipment and accessories.
- Act as range officers for demonstrations.
- Assist in setting up bows for next session.

Parental Involvement

- See Roles for Teen and Junior Leaders above.
- Arrange for transportation to meeting site.
- Arrange for refreshments.
- Deliver parts of the program.
- Demonstrate shooting safety points.

4-H and Youth Development Specialist, Texas Agricultural Extension Service.

Best Time to Teach

Any time of year but prior to live shooting

Best Location

Classroom or other comfortable site

Time Required

About 40 minutes to 1 hour

Materials/Equipment

- longbow, recurve bow and compound bow
- wood, fiberglass, aluminum and graphite arrows
- set up target bow (if available)
- set up hunting bow (if available)
- assorted bow stringers (see Fact Sheet: *Bow Stringers*)
- arm guard, finger tab and shooting glove
- release
- bow square
- nocking points and point pliers
- masking tape and marking pen, whistle
- tape or rope for shooting line

References

- National Archery Association, Instructor's Manual*, third edition. P. Baier, J. Bowers, C.R. Fowkes and S. Schoch. National Archery Association of the U.S., Colorado Springs, CO. 1982.
- Archery: Steps to Success*. K.M. Haywood and C.F. Lewis. Leisure Press, Champaign, IL. 1989.
- Teaching Archery: Steps to Success*. K.M. Haywood and C. F. Lewis. Leisure Press, Champaign, IL. 1989
- Archery: A Planning Guide for Group and Individual Instruction*. J.W. Smith, ed. American Alliance for Health, Physical Education, Recreation and Dance, Reston, VA. 1972.
- Bowhunting Deer: International Bow hunter Education Manual* W.H. Wadsworth. International Bowhunter Education Foundation. Murray, KY. 1978.

Teaching Outline

Presentation

I. Origins of archery

- A. Hunters and warriors
- B. Shooting at “long” range
 1. Hunting or warfare
 2. Target shooting
- C. Types of early bows
 1. Self and composite bows
 2. Shapes and length
- D. Modern archery (mid – 1800’s)
 1. Influence of Civil War
 2. Ishi, Saxon Pope, Art Young
- E. Developments in materials and engineering
 1. Bow technology
 - fiberglass, graphite and laminated limbs
 - compound bows
 - wheeled bows
 - cam bows
 - cam-limb bows
 - overdraws
 - sights
 2. Arrow technology
 - shaft material
 - fletching
 3. String changes
 - Dacron
 - Kevlar
 - Fastflight
 - cables
- F. Similarities to the old days
 1. Hand-eye coordination
 2. Need for practice
 3. Shooting principles
 4. Safety considerations

II. Archery Safety

- A. Arrow actions
 1. Penetrating
 2. High momentum
 3. Low shock
 4. Dangerous until stopped

Application

DISPLAY illustrations of early hunters, American Indians or ancient warriors.

ASK – for how long was the bow the main tool of the hunter and weapon of the warrior? Try to get answers spanning pre-history to the 1600’s.

DEMONSTRATE equipment as it is discussed. ANSWER questions as they are posed by the group.

ASK – how is archery the same today as it was long ago? Look for answers mentioned here.

DEMONSTRATE penetration and shock differences between arrows and bullets if a safe range is available. (*See Fact Sheet 20: Penetration and Shock.*)

- B. Relative penetration ability
 - 1. Greater than rifle
 - 2. Straight up dangerous
- C. Offensive parts
 - 1. Arrow at both ends
 - 2. Fletching
 - 3. Bow limbs
 - 4. String
 - 5. Nocking point indicator
- D. Faulty, inadequate or mismatched equipment
- E. Weapon or fun?
 - 1. Your choice
 - 2. Mental control or physics
 - 3. Yours while on the string
 - 4. Need for respect and care
 - user responsibilities
 - enforcing safety
- F. Principles of archery safety
 - 1. Clear zone of fire
 - 2. Pointed
 - 3. Target identification
 - 4. Watch nocks and points
 - 5. Loaded only for shots
 - 6. Always treat with respect
 - 7. Avoid shooting if tired, distracted or under the influence of any drug
 - 8. Be extremely careful when retrieving arrows
 - 9. Be sure all tackle is in perfect working condition and free from damage
 - 10. Always hold to strictest codes of conduct, ethics and sportsmanship

ASK – why is an arrow shot straight up dangerous? DISCUSS responses.

USE an airbow or a demonstration shot in a safe area to stimulate thinking. ASK – what are some of the possible safety concerns with archery tackle or shooting? ADD any items they fail to mention.

ASK – what make the difference between a weapon and a recreational tool? Work for answers that stress the intent and use of the equipment.

DISCUSS firearms safety and how it relates to archery safety. ASK – what differences between bows and firearms result in changes in safety considerations.

DISCUSS penetration and sharp points on both ends of arrows. DISCUSS also the need for a larger cleared area for the limbs to operate safely.

III. Orientation to Archery Tackle

- A. Bows
 - 1. Riser
 - grip or handle
 - arrow shelf
 - sight window
 - handedness
 - arrow rest

ILLUSTRATE/DEMONSTRATE each item as it is discussed. Be sure all participants can see clearly.

- arrow plate
 - plunger or button
2. Limbs
 - face or belly
 - back
 - tips and string nocks
 - cams or eccentric wheels

B. Bowstrings

1. Construction
 - Dacon, Kevlar or Fastflight
 - one-looped strand
2. Servings
 - end loops
 - center (mono)
3. Nocking point indicator

DISCUSS advantages and disadvantages and uses of each material.

C. Arrows

1. Shaft materials
 - wood (cedar)
 - fiberglass
 - hollow
 - solid
 - graphite tubing
 - aluminum alloy
2. Spine or stiffness
 - matched to bow
 - need for matching
3. Nocks
 - string holding device
 - different types
4. Points
 - target points
 - field points
 - broadheads
 - blunts
 - other types
5. Fletching
 - feathers and vanes
 - index (cock) vane
 - types of fletching
 - straight
 - offset
 - helical
 - flu-flu
 - purposes
 - matching to use
 - target
 - hunting
 - others
6. Cresting or signature
 - decoration and identification

ILLUSTRATE “archer’s paradox” – need to bend in order to fly straight.

- identifying each shaft individually
- D. Other accessories
1. Arm guard
 - purposes
 - location
 2. String-hand protection
 - finger tab
 - clean release
 - how worn
 - shooting glove
 - mechanical release
- E. Quivers
1. Types of quivers
 2. Purpose of quivers
 3. Types used here

DEMONSTRATE use of arm guard and finger tab or glove. ASK – what is main purpose of arm guard? Lead them to conclude: 1) keeping the clothing away from the string and 2) preventing string slap.

Have participants PUT ON a tab with supervision and help.

IV. Eye Dominance

- A. Determining eye dominance
1. Importance of master eye
 - naturally
 - ease in retraining hands
 - difficulty in retraining eyes
 2. Use partner method
 - overlapped hands
 - looking at partner's nose
 - bringing hands to eye
 - watch for “cheating”
 3. Selecting bow for eyedness
 - string-hand and dominant eye on same side
 - sight window on bow-hand side (opposite side from dominant eye)
- B. Terminology for instructions
1. String-hand side
 - dominant-eye side
 - refers to drawing hand
 2. Bow-hand side
 - off or non-dominant side
 - hand that holds bow

DEMONSTRATE how to determine the master eye. Have participants pick a partner and determine their master eye. (*See Fact Sheet 3: Determining Eye Dominance.*)

ILLUSTRATE bow selection. HELP each participant pick a bow for their eyedness.

Have each archer stand with their bow hand toward their partner and draw their string hand back. CHECK to be sure they understand the terminology.

V. Safe stringing techniques

- A. Safety for archer and bow
1. Unacceptable methods

DEMONSTRATE, without stringing the bow, the dangers to archer or bow in using these methods. STRESS that they are NOT RECOMMENDED.

- step-through
 - push-pull
2. Acceptable methods
 - cord stringers
 - wall stringers
 - box stringers
 - bow presses
 - bow relaxers

B. Caution about dry firing

V. Range Procedures

A. Relationship to other shooting

1. Need for control
2. Need to assure safety
3. Everyone responsible
 - watch for unsafe conditions
 - obey all commands immediately

B. Whistle system/Voice commands

1. Two whistle blasts/“Archers to the shooting line”
 - Archers walk carefully to the shooting line
 - One foot on either side of the shooting line
 - Keep arrows in quiver,
2. One whistle blast/“Commence firing”
 - Remove arrows one at a time from quiver, load bow, shoot at target
 - When all arrows have been shot, step behind waiting line, place bow on rack, wait for signal to walk forward to remove arrows from the target
3. Three whistle blasts/“Retrieve arrows”
 - Walk carefully toward your target to retrieve arrows
 - Stop at the target line for additional instructions
4. Four or more whistle blasts in rapid succession/“Cease fire”
 - Dangerous condition
 - Stop shooting, even if ready to release
 - Place arrow back in quiver
 - Wait for signal to resume shooting

DEMONSTRATE proper use of one or more bow stringing devices. Have archers PRACTICE stringing and unstringing bows under supervision of adult or junior leaders.

DISCUSS a useful set of range procedures. LIST some reasons for standard range commands. REVIEW archer responsibilities.

DISCUSS appropriate ways to be sure commands are obvious. ILLUSTRATE each one using adult or junior leaders.

HAVE each archer work through a series of commands without equipment.

ASK – why should the line captain be the first one down range?

ASK – why is it important to limit the number of people at a target? EMPHASIZE potential danger from nocks on pulled arrows.

- watch for undershot arrows
 - danger to archers
 - sharp nocks
 - tripping
 - danger to shafts
 - bending or breaking
- line captain observes searches for overshot arrows
- tell archers to be prepared to shoot next meeting
 - signal to other archers
 - bow over target
 - arrow upright
 - search as a group
 - line captain returns to line last

C. Field shooting changes

1. Toe to line or stake
2. Bow across target face

D. Spacing on shooting line

1. Beginners at least 2 to 3 meters (6 to 10 feet) apart
2. More advanced archers need less room
3. Change in arrow handling
 - Arrows nocked on upright bow

E. No bows drawn or arrows nocked except on shooting line

F. Range behavior and etiquette

1. Appropriate clothing
2. Distraction
3. Sportsmanship and ethics

VII. Conclusions

- A. Archery is as safe as YOU make it
- B. Basics have not changed with technology advances
- C. Range safety is everyone's job
- D. Proper bow handling is ease and mostly common sense
- E. Some possible exhibits
- F. Next time we start shooting

ASK – why is it important to watch where you are stepping?
EMPHASIZE the damage to either anatomy or arrows.

ASK – why must persons be so careful when looking for overshot arrows? STRESS being out of sight down range.

ASK – why should the line captain be the last one back?

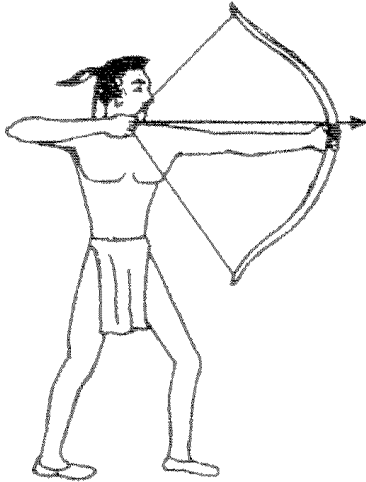
DEMONSTRATE proper way to nock an arrow, first using the bow as a shelf (beginners), then coming straight over shoulder and upper limb.

EMPHASIZE the need for concentration, respect for others and caution in all forms of shooting.

REINFORCE points of safety and range behavior.
EMPHASIZE the need for all archers to be actively involved in the safety of their sport.

Introduction

Archery equipment has been used by hunters and warriors since prehistoric times. The bow could be shot at long ranges, allowing the archer to stay away from potentially dangerous animals or enemies. Archery target shooting is also old. Without a doubt even cave dwellers held contests to see who could shoot the best.



Early bows ranged from simple staves of wood that were shaped for better performance to strongly re-curved bows that were reinforced with horn, bone or sinew to increase toughness, speed or cast. Bows were designed to meet specific needs. Those to be used while standing or walking were much longer than those used while riding horseback. Thus, the **English longbow** was a far different design than the short, **re-curved bows** used by the Mongols and the Turks.

Modern American archery dates from the middle of the 19th century. As the war between the states came to an end, many people who had to live off the land were denied access to firearms. They relied on bows to live. The Compton brothers wrote of their experiences with the bow during that period. When Ishi, the last Yana Indian, taught the art of making and hunting with archery equipment to Art Young and Saxon Pope, those men began to popularize bowhunting. The rebirth of archery in the United States began.

Developments in materials and engineering produced as number of resilient substitute for wood. Laminated bows used the strength and cast of fiberglass and the lightness of wood to increase the speed of the bow. Designs changed, adding cast by re-flexing or re-curving the limbs. Still later, mechanical advantages were added as compound bows were developed and their limbs were fitted with eccentric wheels, cams or even crammed limb tips to make the bows faster still.

During this time, other parts of the archer's equipment were also changing. Arrow material changed from wooden dowels to fiberglass, aluminum or graphite tubes. **Fletching**, once mainly turkey or waterfowl feathers, now includes both hard and soft plastics. Strings went from woven strands of waxed linen to Dacron, Devlar or Fastlight strands with monofilament servings. Arrow shelves were extended toward the string, permitting use of shorter, lighter arrows, producing less arrow flex and greater arrow speed. Sights were added to enhance accuracy and to assist in precise shot placement.

Archery moved into the age of technology, but it continues to be a sport involving hand-eye coordination, consistency and the need for practice to become proficient. Archery remains a sport with relatively slow projectiles shot over relatively short ranges. Basic knowledge and awareness of common safety considerations are necessary for safe, responsible and enjoyable use of archery equipment. Let's look at some archery equipment and ways for using it safely.

Archery Safety

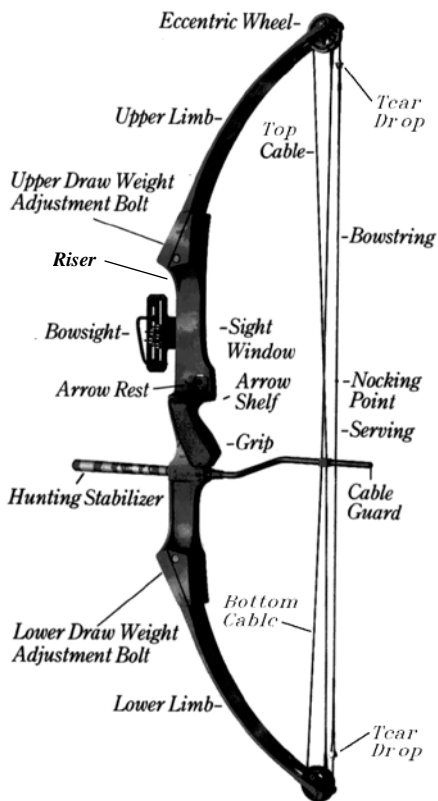
Arrows are dangerous until they come to a complete stop. The entire flight path, from release until the arrow stops, must be clear and safe. This is the same as having a safe field of fire with a firearm. As with firearms, the arrow should only be pointed in a safe direction. Unlike firearms, however, straight up is not a safe direction. An arrow shot straight up poses an extreme danger while a bullet shot straight up poses very little threat. The arrow is much more dangerous than a high-powered rifle in that situation.

Archery equipment is designed to penetrate with a heavy, relatively slow projectile that has a large amount of momentum. Even target bows have enough momentum to drive an arrow through a human being. Arrows produce very little shock (**hydrostatic shock**) on impact, but they penetrate much more effectively than rifle bullets. That fact can easily be demonstrated by shooting both types of projectiles into a container of sand or a hay bale. Unlike firearms, archery equipment has multiple points of potential danger to the user or persons standing nearby. The point of the arrow, the arrow's nock, the tips of the limbs, the nocking point indicator and the string and/or cables of the bow all are capable of producing an injury. Faulty, inadequate or mismatched equipment can also pose a threat to safety.

Bows and arrows can be dangerous penetrating weapons, or safe, exciting and entertaining recreational arms. The difference lies in the mind and the control of the user. While the arrow remains on the string and the string is in your fingers, the arrow is under your mind's control. When the string is released your control comes to a stop and the law of physics takes over.

Archery equipment must be treated with respect and care. All the principles for safely handling firearms apply to archery equipment as well. The user alone is responsible for safe, responsible and appropriate use. If any doubt exists about the absolute safety of a shot, do not release the string. The safety of archery is in your hands. So, it is essential that simple principles of safe shooting be accepted and enforced. Many of the principles of safe shooting can be summarized in these simple statements.

1. Always be absolutely sure that the path to the target and beyond is clear.
2. Never point a drawn arrow at anything you do not intend to shoot.
3. Always be absolutely certain that the target is clearly visible, safe to shoot and appropriate.
4. Always be aware of the danger areas at the end of the arrow and the tips of the limbs.
5. Place an arrow on the string only when you are ready to take a shot. Never fool around with your archery tackle. Respect it.



6. Never use archery equipment while your mental ability is impaired by fatigue, distractions or the influence of any drug.
7. Always exercise caution when retrieving arrows or removing them from a target.
8. Always be sure that all archery tackle is in perfect working condition and free from damage before it is used.
9. Always abide by the strictest codes of behavior and ethics applied to the archery sport in which you are participating. Including specific range rules.

Perhaps you can think of others that might be added.

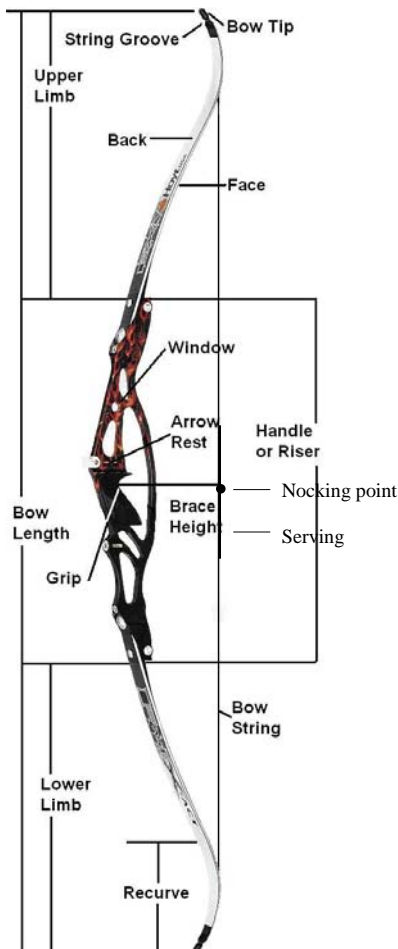
An Orientation to Archery Tackle

Bows

A bow consists of a handle or **grip**, a center section (**riser**) and a pair of **limbs**. The grip or handle is usually shaped to permit the bow hand to seat well. Just above it is a cut out area known as a **sight window**. The sight window is on the left hand side of the bow for right-handed archers and on the right side for lefties. The **arrow shelf** is at the bottom of the sight window. It normally is not used to support arrows in modern bows. Instead, an **arrow rest** is positioned just above the shelf. The portion of the rest that lies along the side of the sight window is called an **arrow plate**. Sometimes it is adjustable. Often archers install a spring-loaded **plunger** or button to aid in tuning the bow. The entire riser section may be constructed of the same materials as the limbs, or it may be a separate piece of wood or metal. The limbs are usually solid fiberglass, graphite or laminated glass and hardwood. Conventional bows (recurve bows and longbows) have nocks at the end of each limb to hold the string in place. Compound bows have **wheels** or **cams** at the tips of the limbs. They also have **cables** and some other items not found on the conventional bows. The part of the bow that faces that archer is called the **face** or belly of the bow. The part that faces the target is called the **back**.

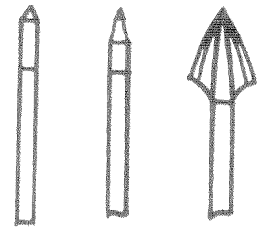
Bow Strings

Almost all modern bow strings are made from a continuous strand of Dacron or some other string material looped several times. Thus, when one strand of a string is broken, the entire string is broken. Most strings have loops on both ends to fit the string nocks or other means of attaching to the bow. Those loops are protected by windings of heavy thread known as **servings**. A middle serving, often of monofilament, protects the string from wear where the arrow and the fingers touch it during shooting. The middle serving should have one or more **nocking point indicators** (metal, plastic or thread) to locate the arrow in the same place on the string for each shot.

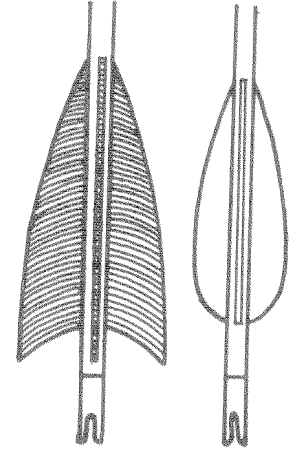


Arrows

The projectiles or **arrows** are tubes or bolts of wood, fiberglass, graphite or aluminum. The stiffness, or **spine**, of these shafts is matched to the **draw weight** (strength) of the bow. The end of the arrow that is placed on the string has a **nock**, usually a plastic device with a notch that holds the string. The other end has some type of point, depending on the type of shooting being done. **Target points** are usually conical or bullet shaped. **Field points** usually feature a point with an elongated and somewhat thinner tip than the main body of the point. Broadheads usually have two or more cutting edges attached to a central ferrule. Several other types of points are also available, but they are used by more advanced archers.



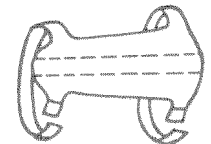
Near the nock, the arrow is equipped with some type of **fletching**. Usually the fletching consists of three shaped feathers or plastic vanes, but some arrows use four or even six vanes or feathers. The fletching may be straight, slightly angled or helical, depending upon the intended use. Its purpose is to help stabilize the arrow in flight. Hunting arrows usually have at least three large vanes or feathers. The fletching on target arrows may be much smaller. **Flu-flu arrows** have massive amounts of fletching to limit the flight distance of the arrow.



Just beyond the fletching, the shaft may be marked with a pattern of painted stripes, called crestring or a signature. The crestring is used either to decorate or to identify the ownership of the shafts. Many target archers, and a few bow hunters, mark each arrow individually so they can watch for differences in performance between them.

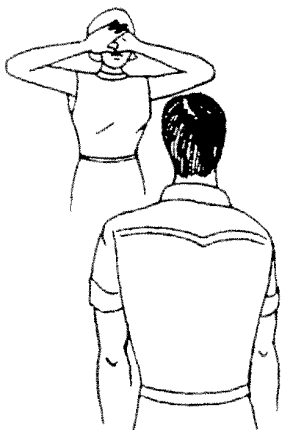
Other Accessories

The beginning archer needs a few other items to be fully equipped. An **arm guard** is needed for the bow arm. It should be worn on the inside of the arm between the wrist and the elbow. Arm guards come in a wide variety of types, but all of them help to reduce the pain of string slap (usually an indicator of poor shooting form) and to keep the clothing out of the string's path. Several types of gear are used on the string hand. Archers use **finger tabs**, **shooting gloves** or **mechanical releases** to hold the string. All have merits and drawbacks. For learning purposes, a finger tab is recommended. The tab is worn on the inside of the index, middle and ring fingers of the dominant or string hand. Most tabs have a split that lines up between the index finger and the middle finger to permit split finger shooting. A single finger attachment is used on the middle finger of the shooting hand most times.



Many types of **quivers** are available for the first few trips to the shooting line, your "coach" will be the quiver, handing you the arrows one at a time. Later we will switch to using ground quivers. As you progress, you will want to get a quiver (or quivers) that match your shooting needs.

Eye Dominance



Before you learn to shoot, you need to determine your eye dominance. *Fact Sheet 3: Determining Eye Dominance* provides more information about it and ways to test it. Pick a partner to help test for eye dominance. Stand facing your partner about 2 meters (6 feet) apart. Place one thumb over the other and cross your fingers over the fingers of the other hand, leaving a small triangle. Raise both hands together, keeping both eyes open and the head straight toward your partner. Look at your partner's nose through the opening. The partner should note which eye can be seen through the opening. Now, keeping the nose in the opening, bring your hands slowly back to your face. Your partner should watch for any "cheating" where the hands seem to wander from eye to eye. The eye that your hands return to is your dominant eye. Now switch roles and try it again. Do not be concerned if your handedness and eyedness are different. A significant minority of the people in the world are cross dominant.

Your best shooting will occur when the dominant eye is on the same side as the drawing or string hand, and the "off" eye is on the same side as the bow hand. All directions will be given using those terms. The handedness of the bow is determined by holding it as you would when shooting. The sight window is on the opposite side of the bow from its handedness. That is, a right-handed bow (for a right-eyed archer) will have the sight window cut into the left side of the bow and be held in the left hand. Once you have selected a bow that is appropriate to your eyedness, discuss its parts with your partner. If you need help, ask a parent or junior leader for assistance or advice.

Stringing and Unstringing Bows Safely

There are many ways to string or unstring bows. Most compound bows are simple left strung all the time, but recurve bows are usually unstrung between uses. Two methods that *should not* be used are the **push-pull method** and the **step-through method**. The push-pull technique is fairly gentle to the bow but has too many dangers for your eyes. We do not recommend it, even when it is done properly. The step-through method is less dangerous to the archer, but potentially damaging to the bow. We do not recommend it either.

Use some type of bow stringer. They are inexpensive to buy or make, and they save both eyes and bows. Try stringing and unstringing the bow you have selected several times while being observed by your parent. Do NOT draw and release the bow without an arrow on the string! Dry firing a bow is dangerous both to the bow and to the archer.

Range Procedures

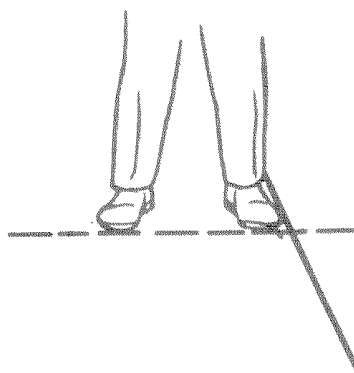
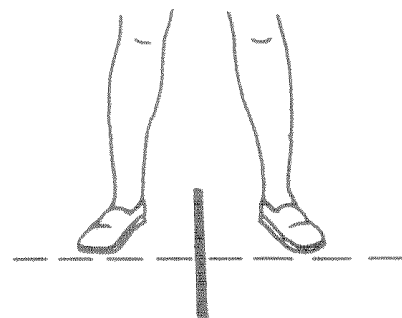
Like other forms of shooting, archery operates under controlled conditions to ensure the safety of all participants. Everyone, not just the

Verbal Command	Whistle Command	Action
Archers to the shooting line	Two blast	Archers come to the shooting line and straddle it
Make ready.		Archers prepare to shoot
Is the line ready!		“Ready” or “not ready”
Commence firing.	One blast	Archers begin firing
End is complete.		Shooting is complete
Retrieve (or score) your arrows	Three blasts	Follow line commander to target butts; wait for scoring or pull arrows from target
Cease fire!	Four or more blasts in rapid succession	Immediately STOP shooting – unsafe condition; wait for commence firing command or one whistle blast to resume shooting
<p>NOTE: The line captain ensures that all archers have returned to the ready area before returning from the butts. *In tournament shooting the archer must remain at least arm’s length away from his or her arrows until they have been told to pull them by the scorer.</p>		

Range officer or line captain, is responsible for safety. Any unsafe condition must be brought to the attention of the person in charge IMMEDIATELY. All range commands, whether verbal, visual or whistle must be obeyed immediately. Small groups may be controlled with simple voice commands, but larger groups or tournaments are better addressed with whistle, horn or light commands. For our purposes, keeping the commands as close to those used in other shooting sports is best to avoid confusion.

Several modifications apply in **field shooting**. Rather than straddling the line like in target archery, the archer toes the shooting line or stake. In addition, when retrieving an overshot arrow, the archer should place their bow directly across the face of the target to let following archers know that someone is down range and possible in the line of fire. Some archers use an arrow stuck upright in the target butt as an indicator, but the bow is a super sign.

In both types of shooting, archers should be far enough apart to ensure they do not interfere with one another. We will be spacing ourselves about 2 meters (6 feet) apart since our first shot will be made using the bow as a shelf for the arrow while nocking it. Later, as you become more skilled at handling your equipment, we can reduce the spacing between archers to about half that distance. At that point the arrows will be placed on the string while the bow is held more or less vertically. Arrows are never nocked until the command to shoot is given, and bows are never drawn except during live firing or on command.



Conclusion and Summary

That concludes the lesson on archery equipment and safety. Are there any questions?

Be sure to review this material before our next session. At that time we will start developing good shooting form on the range. Please mark the bows you have selected by writing your name on a piece of masking tape. Put the tape on the back of the sight window from the arrow rest to the top of the sight window.

Summary Activities

1. Have junior leaders or parents review archery terms and safety considerations with small groups of participants.
2. Have junior leaders or parents supervise young people in stringing and unstringing bows using cord, box and wall stringers.
3. Without equipment, have participants practice range rules and behavior either inside or on an outdoor range.
4. If they are not already equipped with nock sets, have each participant locate and attach a nocking point indicator to their selected bow with the assistance of a leader or junior leader

Exhibit and Sharing Ideas

1. Make posters of range rules, archery safety principles or archery tackle with parts identified.
2. Construct quiz boards that match parts with points indicated by letters, numbers or other means.
3. Construct and demonstrate a bow stringer.

Developing Proper Archery Shooting Form

Ronald A. Howard Jr. *

Objectives

Participating youth and adults will:

1. Demonstrate and practice the fundamentals of proper archery shooting form.
2. Understand and apply the “11 steps to the 10 rings” when shooting.
3. Successfully shoot groups using instinctive shooting methods.
4. Establish mental and physical skills leading to consistently good shooting form.
5. Demonstrate proper form through “coaching” other archers.
6. Have fun while learning.

Roles for Teen and Junior Leaders

- Demonstrate proper shooting form.
- Demonstrate form faults for correction by participants.
- Serve as on-line assistants.
- Serve as line captains or range officers.
- Provide positive reinforcement of proper form for students with form faults.
- Assist with locating overshot and undershot arrows.

Parental Involvement

- See Roles for Teen and Junior Leaders above.
- Provide or coordinate transportation to the range.
- Serve as coaches for one or two “coach-pupil” pairs on the shooting line.
- Provide or coordinate refreshments.
- Assist with developing exhibits or conducting summary activities.

Best Time to Teach

Any time of year

Best Location

Range space (indoor or outdoor) is required

Time Required

Approximately 1 hour

Materials/Equipment

- light recurve bows (15 to 30 percent left handed)
- matching arrows (26 to 31 inch lengths)
- finger tabs
- arm guards
- large target butts
- small stick-on dots (aiming points)
- ground quivers (*see Fact Sheet 7: Ground Quivers*)
- posters showing shooting steps
- shooting line, tape or materials to make one
- whistle (if group size warrants)

References

- National Archery Association Instructor's Manual*, third edition, P. Baler, J. Bowers, C.R. Fowkes and S. Schoch. National Archery Association of the U.S., Colorado Springs, CO. 1982.
- Archery: Steps to Success*, K.M. Haywood and C.F. Lewis. Leisure Press, Champaign, IL. 1989.
- Teaching Archery: Steps to Success*, K.M. Haywood and C.F. Lewis, Leisure Press, Champaign, IL. 1989.
- Archery: A Planning Guide for Group and Individual Instruction*. J.W. Smith, ed. American Alliance for Health, Physical Education, Recreation and Dance, Reston, VA. 1972.

4-H and Youth Development Specialist, Texas Agricultural Extension Service

Teaching Outline

Note to Instructors: The outline is condensed to reduce the amount of space required. Good teaching style will likely require several repetitions for beginning archers. DISCUSS and DEMONSTRATE proper shooting form (*instructor should not shoot*). PRACTICE the mimetic steps suggested without equipment, with an air bow or just a bow. Finally USE live firing with an emphasis on successfully shooting groups, disregarding the location of the groups on the target. LIMIT each archer to about three to four arrows per end. SHOOT no more than four or five ends per archer before pausing to DISCUSS the elements of form and giving the kids a chance to REST. This approach not only encourages development of good shooting form, but also helps prevent poor shooting habits caused by fatigue.

Presentation

I. Introduction

- A. Simple basics of good shooting
 - 1. Relaxed body
 - 2. Intensely focused mind
 - 3. Archer's paradox
- B. Comfortable position
 - 1. Easy to repeat
 - 2. Minimum muscle activity
- C. Practiced form needed
 - 1. Concentration on one form item
 - 2. Instilling good habits
 - 3. Consistency needed
 - form
 - results
 - perfect practice
 - 4. Successful form taught
 - same for all archery
 - basic to good shooting

II. Archery form basics

- A. Eleven steps to success
 - 1. Stance and posture
 - 2. Nocking an arrow
 - 3. Setting a hook
 - 4. Bow-hand grip
 - 5. Raise & extend bow
 - 6. Draw
 - 7. Anchor
 - 8. Aim
 - 9. Release
 - 10. Follow through
 - 11. Relax and evaluate
- B. Need to establish each step
 - 1. Good shooting routine

Application

ASK what is needed to shoot a bow successfully. Gently REJECT answers that emphasize strength and great physical skill. EMPHASIZE consistent form and developing sound basic skills as well as concentration.

Have a parent or junior leader DEMONSTRATE one shot with a bow or with an airbow indoors.

ASK what the parts of this shooting sequence are. Use questions to get the participants to LIST the items included here.

2. Mind free to concentrate
3. Always emphasize safety

C. Stance

1. Normal standing position
 - relaxed
 - comfortable
2. Foot position
 - straddling line
 - shoulder width apart
 - line through toes to target
 - square stance value
 - straight line to target
 - string slap avoided
 - muscle fatigue
3. Hips and shoulders in line with target
4. Head
 - erect and relaxed
 - rotate toward bow-hand shoulder

D. Bow-hand position and grip

1. Relaxed grip
 - bow floats in hand
 - touch tips of index finger and thumb
 - use sling to hold bow in hand
2. Hand shake with bow
 - hand vertical
 - bow handle in web between thumb and fingers (U-shape)
3. Bow-arm elbow rotated out
 - arm swings parallel with the ground
 - bow-arm shoulder and elbow locked out
4. Two primary wrist positions
 - high wrist: wrist in line with forearm
 - one contact point
 - bow floats in web of hand
 - similar to free-floated rifle barrel

REINFORCE the need for constant safety awareness.

Using a rope, tape or other shooting line, have each participant PRACTICE taking a comfortable and square stance.

Using an arrow in place of the string or an airbow, DEMONSTRATE why a square stance keeps the string away from the body.

NOTE that this is particularly important for female archers.

Have participants PRACTICE gripping a bow with a light touch.

PRACTICE elbow rotation by pushing against a wall or post with a flat hand and rotating the elbow out.

CHECK rotation by swinging hand toward chest.

DEMONSTRATE high-wrist position. DISCUSS its advantages/disadvantages and normal use.

ASK why might bowhunters prefer this style. Good answers focus on changes in form because of excitement.

- less sensitive to minor changes in grip and hand position
- preferred by many bow-hunters
- low wrist: hand above line of forearm
 - handle seated in relaxed hand
 - similar to glass-bedded rifle barrel
 - uniform grip yields consistent results
 - preferred by target archers
 - reduced fatigue
 - consistent seating of bow in hand

DEMONSTRATE low-wrist position. DISCUSS its advantages/disadvantages and common uses.

ASK why might target archers prefer this type of wrist position. Good answers focus on reduced effects of muscle fatigue and consistent form.

DEMONSTRATE nocking an arrow using both techniques. Have each participant PRACTICE each technique with arrows pointed in a safe direction and without actually placing them on the string.

E. Nocking an arrow

1. Bow used as shelf for beginners

- at least 10 feet apart
- sight window up
- slide arrow forward
- set arrow on rest
- rotate index vane up
- draw back to string
- nock under nocking point indicator (between if 2 used)

2. Bow held vertically

- reasons in target shooting
- cant bow slightly to drawing hand side
- rotate slightly to let shaft clear string.
 - keep the shaft pointed down range
- reach forward, placing arrow on rest
- index vane out
- slide back to string
- nock under indicator

F. Setting a hook

1. Hooked finger tips draw bow string

- back of hand flat
 - scout salute
 - thumb on little finger
- fingers bent at second joint

2. Draw types

- split-finger draw
 - Turkish
 - index finger above nock

DEMONSTRATE and PRACTICE making a salute, then a hook. Have archers use finger tabs. CHECK to be sure they are worn properly.

DEMONSTRATE each draw type EMPHASIZE the use of the split finger draw and high anchor (corner of the mouth).

- ring and middle fingers below nock
- Apache draw
 - cheekbone anchor
 - three fingers under nock
 - excellent close range anchor
 - nock very close to eye

3. String placement

- String at first joint of fingers or slightly deeper
- Keep back of hand flat during draw
- “finger pinch” or arrow swinging away from rest
 - curling hand during draw
 - correcting it
 - salute
 - deeper grip

PRACTICE string placement with an airbow or by drawing a conventional bow *only one inch*.

DISCUSS “finger pinch” and how to correct it.

G. Raise and extend bow into shooting position

1. Focus attention on target

- bow arm elevated about 15 degrees
- string arm in line with shaft
- hook set on string

2. Rotate bow to shooting position

- pivot arms at shoulders
- raise to shoulder level
- bow arm fully extended
- string forearm in line with shaft

3. Many “instinctive” archers extend and draw in one motion

DEMONSTRATE and PRACTICE raising the entire unit.

H. Draw

1. Smooth motion

- flex elbow using arm muscles
- pull elbow back with shoulder and back muscles
- draw to anchor point

2. Concentration on target deepens during draw

DISCUSS the mechanics of drawing an arrow.

Have participants PRACTICE using an airbow, if one is available or use mimetics without equipment.

POINT OUT – No sky draws and watching for an “over bowed” condition

I. Anchor

1. Consistent anchor point

- “rear sight”
- checkpoints

ASK – why is a consistent anchor point important? DISCUSS the dominant eye’s function as a rear sight.

2. High anchor
 - corner of mouth
 - index finger tip on upper canine tooth
 - thumb behind angle of jaw
 - point of cheekbone for Apache draw

3. Low anchor discussed later with sights

J. Aim

1. Instinctive shooting
 - concentrate on spot
 - small spot gives more accuracy and precision
2. Pause to check alignment
 - make sure you are set
 - shoot or let down within a few seconds
 - deliberate shooting
3. Drawing hand firmly anchored
4. Bow arm fully extended

K. Release

1. Very simple action
 - relax hook
 - pull elbow back
2. "Live" release
 - relax fingers
 - draw elbow back
 - fingers flow along side of face
 - bow rocks forward

L. Follow through critical to good shooting

1. Hold release position
 - until arrow hits target
 - bow arm extended in shooting position
 - string hand at end of release position
2. Avoid shooting when tired
 - leads to poor form
 - faults with follow through
 - poor shooting

DEMONSTRATE the corner of the mouth anchor and secondary checkpoints used with it.

Have participants TRY various combinations with or without equipment.

POINT OUT that true instinctive archers do not aim, but concentrate on the target. COMPARE to throwing a ball.

REINFORCE the important of pausing momentarily at full draw to check position and hold.

Have participants DRAW *one draw* and relax fingers to feel a release.

DEMONSTRATE and PRACTICE a live release by pulling hooked fingers against each other with the hands across the chest, relaxing the string hand while pulling. Note movement of the hands and arms.

DEMONSTRATE a proper follow through using an airbow or shooting on the range. DISCUSS the bow arm and string arm.

ASK – why is it important to hold the follow through until the arrow hits?

SEEK answers that center on avoiding bad form, like letting hands drop.

- frustration

M. Relax before next shot

1. Concentration on entire end or match impossible
2. Treat each arrow as the only one
3. Cycle of concentration, relaxation, evaluation

DISCUSS the importance of treating each arrow as if it were the only one.

ASK – can you concentrate to the maximum for very long? POINT OUT the need to relax between shots.

III. Shooting the first arrow

A. Spacing

1. 8 to 10 feet minimum
2. Maximum of two to three archers per target
3. Minimum of one adult coach/instructor per two archers

Have “coaches” CHECK each step with their archers as the line captain walks the group through a shot. Parents, junior leaders or other instructors should back up the coach in EVERY coach-pupil pair.

REPEAT until all members have shot an end of three arrows.

B. Shooting by the numbers

1. Coaches, is the flight ready?
 - coaches respond
 - repeat if needed
2. The flight is ready
3. Take your stance
4. Nock an arrow
5. Set your hook
6. Raise the unit
7. Draw to anchor
8. Focus on aiming point
9. When ready, release and follow through
10. Shoot your other two arrows when you are ready
11. When you have finished
 - Ground your bow on the quiver
 - Take one step back off the line

C. Retrieving arrows

1. Only one person at target
2. Line captain leads
 - watch for undershot arrows
 - damage to arrows
 - damage to feet
3. Pull arrows at butts
 - clear area behind shafts
 - support target beside shaft
 - pull straight back
 - slight twist helps

ENSURE that the line captain leads the group in retrieving all arrows and follows them back to the shooting line.

ASK – why is this important? DISCUSS their responses.

DEMONSTRATE the proper way to remove arrows from a shooting matt, butt or target. Let each member PRACTICE in turn.

4. Retrieve overshot arrows as a group
 - bow across target face as signal to other archers
 - arrow upright in butt as signal
5. Line captain follows group back to line

REMINDE archers about leaving a clear signal for other archers when searching for overshot arrows.

IV. Shooting Groups

- A. Importance of groups
 1. Consistent form
 2. Consistent location
 - correcting impact point
- B. Group, not location, important
 1. Keep same aiming point
 2. Maintain form
- C. Shoot maximum of 9 to 12 arrows

EMPHASIZE that tightly grouped arrows show consistent form and good concentration.

AVOID any comments on the location of groups. REINFORCE proper form and *avoid calling attention to any form faults.*

V. Moving group to desired impact point

- A. Group necessary first
- B. Move aiming point
 1. Place new aiming dot
 - direction you want point of impact to move
 - Distance you want point of impact to move
 2. Shoot group using new aiming dot
 3. Correct by trail and error

ASK – why is it important to shoot groups before trying to move the point of impact? SEE answers above.

DEMONSTRATE how to move the point of impact with a new aiming dot using either diagrams or actual groups. Have each archer try to MOVE their group to the original aiming dot..

VI. Summary

- A. Perfect practice makes perfect
- B. Perfect, consistent form gives consistent results
- C. Steps to a good shot
 1. Stance and posture
 2. Bow-hand grip
 3. Nocking an arrow
 4. Setting a hook
 5. Raise & extend bow
 6. Draw
 7. Anchor
 8. Aim
 9. Release
 10. Follow through
 11. Relax & evaluate

REINFORCE each of these steps with the archers on the firing line. Try to keep the number of arrows shot relatively low (9 to 20 total) between REST and REINFORCE breaks.

Lesson Narrative

Introduction

Successful archery shooting is easy, but people tend to make it hard. Intense concentration and good muscular development are essential. The ability to remain relaxed is also very important. To most people the combination of intense concentration and relaxation seems impossible. Like the archer's paradox where the arrow must bend in order to fly straight, both concentration and relaxation are necessary for top performance.

Like other types of shooting with single projectiles, archery requires that the archer be relaxed and comfortable. Since concentration on the sight or the target is critical to success, the tasks required to fire a shot must be practiced until they can be done without conscious effort. Once they become routine, the mind is free to focus on hitting the mark. This process involves the archer developing consistent form from shot to shot. As the consistency in form improves, consistency in shot placement improves. By focusing on the elements of good form we will make consistently good shooting easier to develop. Some steps will feel strange or even uncomfortable at first. However, they have been proven successful over many years by archers from all over the world.

No matter what kind of archery you select, the basics of proper shooting form are the same. By developing sound, consistent form early in your shooting development, you can reach higher levels of achievement in the chosen sport.

Archery Basics

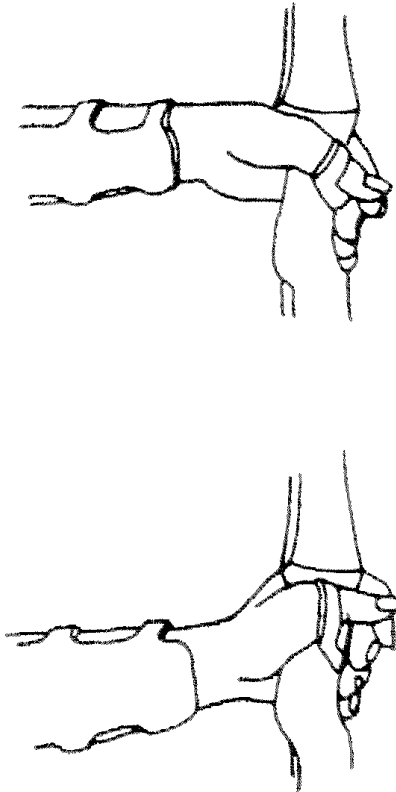
Only a few steps are required to shoot an arrow successfully. You must take a proper stance, grip the bow properly, nock an arrow, grip the string properly, raise and extend the bow arm to shooting position, draw, anchor, aim, release, follow through, and relax and evaluate. That seems simple enough, but the mind cannot cope with that many things all at once. These steps must become established, well-practices habits. Once you have a fixed shooting routine and good shooting form, the mind can be set free to concentrate on the target or the sight pin for more precise shooting.

Stance

A good shooting stance involves a relaxed, erect posture. The feet should be straddling the shooting line, shoulder-width apart. A line drawn across the tips of the toes should point to the center of the target. Some people find that moving the bow-hand foot back a few centimeters (up to about 6 inches) is more comfortable, but that may cause some problems in keeping the rest of the body in line. It forces muscles to work, increasing the potential for fatigue and inconsistency. Lines drawn through the hips and through the shoulders should also point to the center of the target. The head should be erect, relaxed and rotated toward the bow-hand side.

Pick a point as a target, establish an imaginary shooting line and try getting into this stance with your partner's assistance. Once you are comfortable, switch roles, repeating the exercise until both of you feel comfortable.

Bow-hand Grip



Two types of grips are used by the majority of archers. Both of them are relaxed, allowing the bow to move freely on the release. For those of you who are afraid of dropping the bow, either use a sling or lightly touch the tip of the thumb to the tip of your index finger. The grips share several common elements. Both are begun as if extending the hand in a handshake. The hand is held vertically, and the bow fits into the U-shaped opening between the thumb and the fingers. The wrist remains in direct alignment with the forearm. The elbow is rotated out, so that the forearm can move readily toward the center of the chest when the elbow is flexed. A high-wrist grip allows the bow's handle to seat only in the web between the thumb and the forefinger. In this grip the wrist remains straight, aligned with the forearm both horizontally and vertically. The low-wrist grip allows the muscles controlling the hand to relax. This causes the hand to rise above the forearm and the bow handle to seat against the palm of the hand. This grip is similar to having a completely bedded rifle barrel. Like that situation, perfect and consistent bedding of the bow's grip gives very consistent shooting performance. Slight changes from shot to shot, however, produce changes in the point of impact. On the other hand, the high-wrist grip is similar to using a free-floated rifle barrel. The only point of contact is well established, and the bow does its own seating in the hand. Most target archers use a low wrist because they get better performance with it. Many hunting archers use a high wrist because it is less sensitive to slight differences in hand position or pressure. Try both of them with your partner, drawing the bow only one inch.

Nocking an Arrow

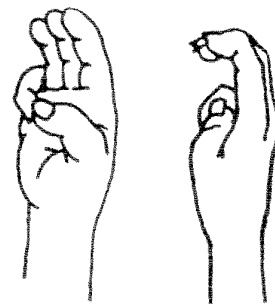
You will learn two ways to nock an arrow. The first is only for learning ease. The second is for accepted target shooting etiquette. We will practice both styles *without* placing the arrow on the string. Be sure you are standing at least 2 to 3 meters (6 to 10 feet) away from other groups and that the arrows are never pointed toward another person. Rotate the upper limb of the bow toward the string hand so that the sight window is up. Using the sight window as a shelf, slide an arrow forward. Rotate the arrow until the index vane (cock feather) is up (facing away from the sight window). Draw the arrow back to the string. Although we will not actually nock the arrow now, the nock is positioned below the single nocking point indicator (toward the lower limb tip) on the middle serving. Some archers prefer to use two nocking points, placing the arrow on the string between them. Try this several times with each partner.

Next, hold the bow almost vertical, canted slightly toward the string hand. Rotate the string slightly (just enough to allow hand to clear it) toward the string hand side. Grasp an arrow near the fletching and reach forward, placing it on the arrow rest. With the arrow on the rest, draw the nock back to the string. Again, be sure the index vane or cock feather is positioned away from the sight window. *The tip of the arrow should be pointed down range during the entire nocking process.*

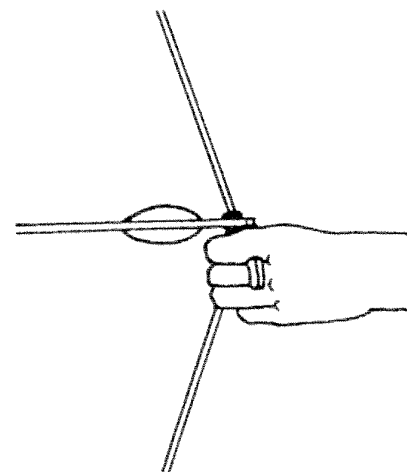
The tip of the arrow should be pointed

Setting a Hook

The string hand uses hooked fingertips to draw the string and the arrow into position for a shot. The back of the hand should remain flat throughout the drawing and shooting sequence. An easy way to ensure that is to use a three-fingered salute. Hold the hand upright, palm forward. Bring the little finger of the drawing hand toward the center of the palm and hold in place with the tip of the thumb. That keeps the hand flat. Next, bend the remaining three fingers into a hook. This approach is used with either a tab or a shooting glove.



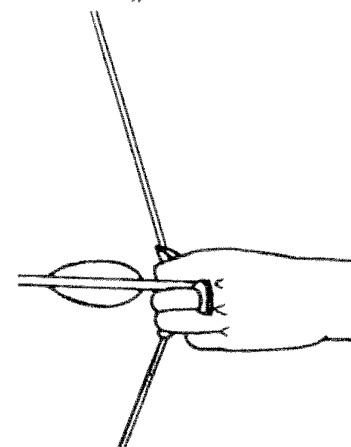
The fingers may be placed on the string several ways. The most commonly used approach is to place the index finger above the arrow and the nocking point indicator and the remaining two fingers below it (*split-fingered or Turkish draw*). Another common approach is to place all three fingers under the nock (*Apache draw*). It is very effective for short range shooting, but carries some risk because the hook is placed very close to the dominant eye. In either case, the fingers are placed on the string at about the last joint of the fingers. A slightly deeper grip, almost to the second joint, is quite acceptable when using a tab. Tabs give more consistent results than gloves with most archers.

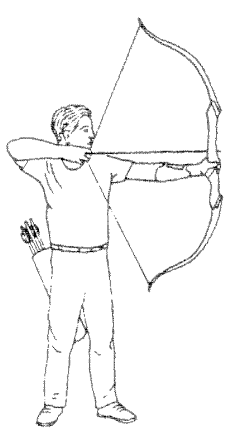


The problem known as “finger pinch,” where the arrow lifts away from the rest, is commonly caused by curling the hand during the draw. It can be cured by taking a slightly deeper grip on the string (almost to the second joint) and/or by folding the little finger and the thumb into the palm of the drawing hand.

Raise and Extend Bow

Once the stance and hand positions are established with a nocked arrow, the entire unit is brought into shooting position at the same time. Start with the bow arm extended about 15 degrees from the body and on a line toward the target. The forearm of the string hand should be set on the string. Moving the arms from the shoulders, fully extended and pointing at the target. The forearm of the string should be extended forward. Many instinctive archers will extend and draw in the same motion, coming to their anchor point as the bow arm settles at full extension. Use two steps here to avoid developing form faults.





Draw

Pull the string back toward the anchor point. At beginning of draw, the upper arm muscles flex the elbow. Then the elbow is drawn back using muscles of the shoulder and back. The draw should be a smooth motion, keeping the forearm in line with the arrow shaft.

Anchor

We will use a high-anchor point in this session. Most archers anchor the tip of the index finger against the corner of the mouth or the canine (eye) tooth on the dominant side. Often a secondary anchor point is used. The thumb may be placed along the angle of the jaw or behind the ear, or it may be nestled against the back of the jaw bone. Since the anchor point establishes the location of the “rear sight” even for instinctive archers, it is essential that the anchor point be consistent. Later we will establish another type of high anchor and a low anchor for use with sights.

Aiming

In instinctive archery, aiming is simply an intense concentration on the target. Pick a tiny spot and concentrate all your attention on it. As in rifle shooting, releasing before you are satisfied with the hold or waiting too long during the aiming phase will lead to large groups and inaccurate shooting. Experienced instinctive archers pause briefly, perhaps a second or two, to be sure of their hold before releasing the string. Although this is not a true sight picture, the archer does form a mental image of the proper relationship between the bow and the target. Throughout the aiming sequence, the string hand should remain firmly locked to the anchor point. Try coming to an anchor point without equipment right now.

Release



A proper release is achieved by simply relaxing the fingers of the drawing hand while pulling the string-hand elbow back slightly. To feel a live release, hook the fingers of one hand into the hooked fingers of the other hand. Holding the hands across the center of your chest, pull with both hands. Note that this requires you to use your back muscles, just as in drawing a bow. Relax the fingers of the drawing hand. The elbows rotate back quickly for a few centimeters (inches). This is exactly what should happen in a live release. The fingers of the shooting hand should flow along the side of the face. The bow should rock forward at the same time. Your partner will be watching for a live release by observing the position of your hands during the follow through.

Follow Through

A proper follow through is essential to consistent, accurate shooting with all types of equipment. Archers must pay particular attention to follow through. The bow arm and string arm should maintain their positions until the arrow is in the target. Fatigue is the prime factor in improper follow through.

Relax and Evaluate

Relax after each shot. Evaluate the feeling of each shot to determine if you accomplished the goal you were trying to achieve. If not, you should refocus your efforts on the feeling of proper shot and try again.

Instructor note: Each person should first practice these steps individually without equipment or use an airbow. Once they are practicing good form with each step, assemble the steps into a shooting sequence. When the sequence is fixed in the archers' mind, take them to the line for live shooting. Coaches need to be involved here –adult or junior leader assistance is extremely important. Be sure the range is short enough that the kids are hitting the target right away.

Shooting the First Arrow

For now, the emphasis should be on shooting consistent groups using proper shooting form. We are not using a target face because scores are not important at this stage. In fact, they may distract from our real purpose. Let's have the first flight of archers and their coaches to the line. Space yourselves about 2 to 3 meters (8 to 10 feet) apart, with the coaches holding the arrows and standing on the string-hand side of the archer. Archers should be wearing their arm guards and finger tabs and be straddling the shooting line. We are going to shoot the first arrow "by the numbers."

1. *Coaches, is the flight ready?* The flight is ready.
2. *Take your stance.*
3. *Nock an arrow.*
4. *Set your hook on the string.*
5. *Raise and extend bow to shooting position.*
6. *Draw to your anchor point.*
7. *Focus on the aiming dot.*
8. *When ready, release, follow through, relax & evaluate.*
9. *You may shoot the other two arrows when you are ready.*
10. *When you have finished, place your bow on the ground quiver (or "ground" it) and take one step back off the line.*

Repeat this process with reversed roles before retrieving the arrows.

Only one member of each group should retrieve arrows. Follow the range officer to the butts. Be careful not to step on or hurt yourself on undershot arrows. Do not go behind target for overshot arrows until those in the targets are pulled, then we will all search together.

Remember to pull all arrows straight back to avoid bending them. To remove an arrow from the matt, place one hand on the matt with the thumb and the rest of the hand supporting it. Grasp the arrow near the matt and pull straight back while twisting the shaft slightly. After all the arrows have been retrieved, return to the shooting line.

Shooting Groups

Now that all of us have had a chance to shoot "by the numbers," let's see if we can shoot some tight groups. Remember to concentrate on

the same point throughout the series. We are not concerned with where the group is, but rather with its size. Consistent form produces smaller groups. Coaches, watch for the elements of form we have been practicing. Keep your comments positive. Reinforce what to do, not what might have been done wrong. We will shoot about three ends of three arrows each before we take a short break.

Moving Groups to the Aiming Point

We can move the group to the center of the target once you are able to produce groups. Simply shoot a group, then place another aiming dot on the opposite side of the original one and the same distance out. That is, if the center of your group is at 7 o'clock to the dot and about 10 inches out, place a new dot at 1 o'clock and about 10 inches out. Focus your attention on the new aiming point and see where the group hits. Use trial and error to move the hits to the center of the original target.

Summary Activities

1. Once archers are successfully shooting groups and hitting about where they are looking, attach balloons to target butts with short pieces of string. Let the archers try breaking them. To add challenge, each coach-pupil pair could shoot as a team, keeping track of the number of balloons broken and the number of arrows shot.
2. Try moving the firing line and allowing the archers to compensate for the change in flight path taken by the arrows. In this case, be very careful not to get beyond the average ability of weaker archers. You want to keep all the arrows on the target.
3. Divide the participants into smaller groups. Have each group discuss elements of good shooting form, things they learned about archery today and elements of form they want to improve.

Exhibit and Sharing Ideas

1. Develop a set of posters or diagrams showing the steps of good archery shooting. Display them or use them to give a demonstration on archery technique to another group or club.
2. Make a ground quiver with a bow support for range use.
3. Shoot several groups using different anchor points to illustrate what happens to group size and placement. Label each group, and be prepared to discuss the reasons for the placement and size.
4. Illustrate how to move a group of arrows to a new point of impact.
5. Start a shooting journal to help improve your shooting. If you already one, list some of the things you learned today.

Instinctive Shooting With a High Anchor

Ronald A. Howard, Jr*

Objectives

Participating youth and adults will:

1. Demonstrate ability to shoot effectively using instinctive shooting techniques and proper form.
2. Practice the elements of safe, responsible and accurate archery shooting in a coach-pupil context.
3. Demonstrate ability to shoot groups and move them to the desired point of impact without the aid of sights.
4. Have fun while learning.

Roles for Teen and Junior Leaders

- Serve as line captain, scorer or assistants.
- Demonstrate shooting technique and ways of correcting the point of impact.
- Observe coach-pupil teams to reinforce elements of proper shooting form.
- Assist archers having particular difficulty.
- Assist with locating overshot arrows.
- Prepare balloons or other materials for the fun shoot.
- Conduct, score or officiate at the fun shoot.

Parental Involvement

- See Roles for Teen and Junior Leaders Above.
- Arrange or provide transportation to the range.
- Arrange for or provide refreshments.
- Give personal examples of shooting exercise.
- Participate in the fun shoot, giving both coach and pupil a chance to teach an adult.

* 4-H Youth Development Specialist, Texas Agricultural Extension Agent.

Best Time to Teach

Any time of year

Best Location

Any safe shooting range, indoor or outdoor

Time Required

Approximately 1 hour (lesson may need to be repeated several times)

Materials/Equipment

- light recurve bows (15 to 30 percent left handed)
- target arrows matched to the bows in 26- or 31-inch lengths
- arm guards
- finger tabs
- target butts
- target pins
- large targets
- shooting line or materials for one
- whistle
- pads and pencils for scoring
- materials needed for fun shooting

References

- National Archery Association Instructor's Manual*, third edition. P. Baler, J. Bowers, C.R. Fowkes and S. Schoch. National Archery Association of the U.S. Colorado Springs, CO. 1982
- Archery: Steps to Success. K.M. Haywood and C.F. Lewis. Leisure Press, Champaign, IL. 1989.
- Teaching Archery: Steps to Success*. K.M. Haywood and C.F. Lewis. Leisure Press, Champaign, IL. 1989.
- Archery: A Planning Guide for Group and Individual Instruction. J.W. Smith, ed. American Alliance for Health, Physical Education, Recreation and Dance, Reston, VA. 1972.

Teaching Outline

Presentation

I. Review of basic shooting form

- A. Stance
 - 1. Feet
 - 2. Posture
 - 3. Head
 - 4. Hips
 - 5. Shoulders
- B. Hand positions
 - 1. Bow hand and grip
 - 2. Elbow rotation
 - 3. String hand and hook
 - 4. Grip on string
- C. Drawing process
 - 1. Raised as unit
 - 2. Flexing elbow
 - 3. Pulling elbow back
 - 4. Fixing on anchor point
- D. Anchor and aim
 - 1. Consistent anchor point
 - 2. Target concentration
- E. Release
 - 1. Relax fingers
 - 2. Pull elbow back
- F. Follow through
 - 1. Fingers flow along face
 - 2. Bow rocks forward
 - 3. Hold until arrow hits target

II. Live shooting with aiming dot

- A. Caution “coaches”
 - 1. Watch form
 - 2. Reinforce proper form
 - 3. Avoid citing poor form
- B. Caution archers
 - 1. Perfect practice
 - 2. Concentrate on form
 - 3. Concentrate on groups
- C. Repeat until satisfied

III. Live shooting with target face

- A. Compare groups with “dot groups”

Application

ASK – what are the basics of good archery shooting form?
Have participants LIST elements of form that lead to consistently good shooting.

Have participants or junior leaders DEMONSTRATE proper shooting form step by step.

Have archers MIMIC the process without equipment.

REMEMBER to pause frequently to let the archers rest.

AVOID going more than two to four ends without resting, reinforcement and positive evaluation.

USE comparison with shotgun shooting or throwing a ball.

ASK – how many had bigger groups this time than on the dot target?

COMPARE size of “aiming” points.

1. Increase in group size
 2. Increases in aiming area
 3. Concentrate on small spot
- B. Move groups to gold using the techniques from last lesson.

IV. Practice with live shooting

- A. Light competition
 1. Emphasis on improvement
 2. Personal progress
- B. Change distances or games
 1. Avoid boredom or excess challenge
 2. Introduce game for fun
 - balloons
 - bow bird
 - clout
- C. Conclude with summary and review
 1. Steps in good shooting
 2. Perfect practice
 3. Consistent form
- D. Repeat lesson until satisfied

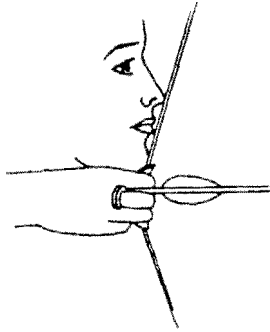
REINFORCE proper form and concentration on a small spot. REFER to previous lesson for form.

INTRODUCE one or more of the proposed activities to offer a different type of shooting experience for the participants.

Have participants REVIEW the activities of the day and DISCUSS things they need to practice to help their own shooting.

This lesson may be REPEATED as many times as necessary to have the young people shooting confidently. If it is repeated, be sure to VARY THE FORMAT to keep interest high.

Lesson Narrative



We learned the fundamentals of good shooting form last session. This time we will apply those fundamentals to instinctive shooting. Instinctive archery shooting is similar to throwing a ball. The ball is not aimed; it is merely thrown while concentrating on a target. Sometimes it is thrown with amazing accuracy and speed. The instinctive archer uses a similar style. Intense concentration on the exact spot he or she intends to hit, along with experience, results in hitting the mark without obvious aiming.

The hands and eyes work together during the concentration phase of the shooting sequence to point or aim the arrow at its target. This is similar to a shotgun archer pointing at the intended target without obvious sight awareness. Unlike the shot gunner, however, the archer cannot be satisfied with simply “being close.” The single projectile needs to strike precisely where it is intended for a good hit to be made. Practice is the key to success with instinctive shooting, and learners should be shooting fairly well after a short period of time.

Let's review the elements of good shooting form from last lesson. The archer needs to take a comfortable and relaxed stance. Feet should be about shoulder-width apart with a line through the tips of the toes pointing to the target. Both the hips and the shoulders should be in line with the target as well. The head should be erect and turned toward the bow-arm shoulder.

The bow hand holds the bow very lightly, with a handshake-like grip. The elbow of the bow-arm is rotated outward. The string hand is flat and the fingers are hooked at the first and second joints. The nocked arrow is situated with its index vane or cock feather facing away from the sight window. The nock is located between the index finger and the ring finger on the drawing hand.

Both arms are rotated into shooting position from the shoulders. The drawing hand is pulled back by flexing the elbow, then drawing it back with the shoulder and back muscles until the fingers are firmly locked to the anchor point.

After a brief pause at full draw to check alignment, the string is released by relaxing the fingers while pulling that elbow back. The fingers flow along the side of the face and the bow rocks forward slightly. The shooting position is held until the arrow is in the target.

Consistent form produces consistent groups, and groups can be moved by changing the point of concentration on the target face. Let's limber up by shooting a few groups on a target that has only an aiming dot on it.

.....*Conduct active shooting session now*.....

Let's put up a target face and see if we can shoot some reasonable scores at this distance.

..... *Conduct active shooting session now*.....

How many of you had groups that increase in size when we went to the larger target face? Why do you think that happened? One of the reasons is that we have a larger aiming point now than when only the small dot was used. Another is that you tried to move your point of impact during the shooting session, sometimes before you had established a group for reference. Remember to concentrate on only a small spot and to keep that spot consistent through each end. Once a group placement has been established, you can move your group to the gold rather easily.

Remember that practice alone does not make perfect. Perfect practice makes perfect. Every archer needs to concentrate on consistent and proper form until those elements become fixed. Even then, they should be reviewed frequently. Those principles of good marksmanship apply to all sorts of shooting: target, hunting or just for fun. Go ahead and shoot one more end. Coaches, let's record the scores on this one.

..... *Conduct active shooting session now*.....

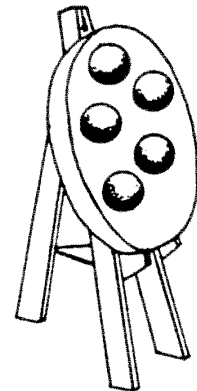
Now, let's shoot a couple more ends to see if we can improve on that score. We are looking for personal improvement, not the highest gross scores.

..... *Conduct active shooting session and analysis now*

Now, let's lighten up a little and try shooting just for fun. The object of this first game is to see who can break the most balloons. We will start back here and work our way forward after every rotation. Each archer gets one arrow at each station.

..... *Play game.*

Let's try a little wing shooting. These special arrows are called **flu-flus**. They are designed to limit the flight distance of the arrow, and they are sometimes used in shooting small game or game birds. We will be shooting this disc target, called a **bow bird**. Archers will stand on the shooting line. I will call the toss. Try to hit the target at



the peak of its climb (it is almost still for a split second at that point). Be sure to take only shots that are completely safe. Non-shooting participant should be alert for any dangerous situations and call out “Cease Fire!” or “No!” if they see any potential for a dangerous shot. (This target can also be rolled to simulate a rabbit. Balloons released on the ground in a light breeze do the same thing.

..... *Play game*.....

We have been pretty good at hitting a small target. How would you like to try one that is about 50 feet in diameter? There is one small catch. The target is a long way away and it is flat on the ground. The object is to see how close to the stake with the flag on it you can shoot an arrow. This is called clout shooting, and we will look more closely at it when we try different archery games.

We have had a lot of fun today, and you have come a long way in your shooting. Remember the steps in good archery shooting. Continue to practice good form each time you shoot. Remember that perfect practice makes perfect and that consistent form brings consistent results. Next time we will try a different anchor point and a different shooting style, using pin sights to help in aiming.

Summary Activities

1. Have small groups repeat the steps of good archery shooting form, reinforcing the steps to the 10 rings with each other.
2. Conduct a shoot, using one or more of the games listed above. Let participants shoot within their known accuracy range, and be sure that all of them have a reasonable chance for success. Try multiple events if time permits.
3. Discuss form with the group, letting each one discuss parts of the action they find difficult. Also discuss what steps they might take to correct and practice that form.

Exhibit and Sharing Ideas

1. List some of the things you learned today in your shooting journal.
2. Record your scores at various distances and in all the events you tried today. Enter them in your shooting journal with the date, location and any comments you might want to add.
3. Tell someone who is not in the 4-H Shooting Sports Program about your experiences with instinctive archery shooting. Record their reactions and your own feelings about the sharing time in your shooting journal.

Shooting With Sights

Ronald A. Howard, Jr*

Objectives

Participating youth and adults will:

1. Demonstrate ability to shoot effectively using simple pin sights and proper shooting form.
2. Practice the elements of safe, responsible and accurate archery shooting in a coach-pupil context.
3. Demonstrate ability to shoot groups and adjust the sights to move the point of impact to the desired location.
4. Have fun while learning.

Roles for Teen and Junior Leaders

- Serve as line captain, scorer or assistants.
- Demonstrate techniques.
- Observe coach-pupil teams to reinforce elements of proper shooting form.
- Assist archers having particular difficulty.
- Prepare balloons for the fun shoot.
- Score or officiate at the fun shoot.

Parental Involvement

- See Roles for Teen and Junior Leaders above.
- Arrange or provide transportation to the range.
- Assist with locating overshot arrows.
- Arrange or provide refreshments.
- Share personal shooting experiences.
- Participate in the fun shoot, giving both coach and pupil a chance to teach an adult.

Best Time to Teach

Any time of year, but after instinctive shooting has been learned

Best Location

Any safe shooting range, indoor or outdoor

Time Required

Approximately 1 hour (may be repeated several times)

Materials/Equipment

- light recurve bows (15 to 30 percent left handed)
- target arrows matched to the bows in 26- or 31-inch lengths
- arm guards and finger tabs
- roll of masking, electrician or duct tape
- long dressmaker's pins with enamel or plastic heads
- felt-tipped pen for marking sight settings
- target butts
- target pins
- large targets
- shooting line or materials for one
- whistle
- pads and pencils for scoring
- materials needed for fun shooting

References

- National Archery Association Instructor's Manual*, third edition. P. Baler, J. Bowers, C.R/Fowkes and S. Schoch. National Archery Association of the U.S., Colorado Springs, CO. 1982.1
- Archery: Steps to Success* K.M. Haywood and C.F. Lewis. Leisure Press, Champaign, IL. 1989.
- Teaching Archery: Steps to Success* K.M. Haywood and C.F. Lewis. Leisure Press, Champaign, IL. 1989.
- Archery: A Planning Guide for Groups and Individual Instruction*. J.W. Smith, ed. American Alliance for Health, Physical Education, Recreation and Dance, Reston, VA. 1972.

* 4-H and Youth Development Specialist, Texas Agricultural Extension Service.

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 3. String hand and hook
 4. Grip on string
- C. Drawing process
 1. Raised as a unit
 2. Flexing elbow
 3. Pulling elbow back
 4. Fixing on anchor point
- D. Anchor and aim
 1. Centered under chin
 - Consistent anchor
 - cleft of chin
 - center of lips
 - tip of nose
 2. Reasons for low anchor
 - Sight adjustment room
 - raising rear sight
 - longer range shooting
 3. Process
 - raise chin slightly
 - draw string to center
 - lower chin until lips and tip of nose touch string
- E. Release
 1. Relax fingers
 2. Pull elbow back
- F. Follow through
 1. Fingers flow along neck
 2. Bow rocks forward
 3. Hold until arrow hits target

III. Setting up to shoot with sights

- A. Making a pin sight
 1. Put tape on back of the bow at the sight window.

Application

REPEAT the review from the previous two lessons.

DISCUSS and DEMONSTRATE the low (under the chin) anchor and checkpoints to be sure it is consistent.

ASK – why is it helpful to lower the anchor point?

NOTE the relationship to raising the rear sights on a rifle or pistol.

DEMONSTRATE and have participant PRACTICE the low anchor without equipment or with an airbow.

REPEAT with live shooting on range.

WATCH forearm alignment with the arrow shaft.

Have adult or Junior leaders ASSIST each participant set up his or her sights.

2. Align bow with target and check approximate level of sight window with bull
 3. Insert pin between tape and back of bow at noted spot
 4. Align pinhead with outside edge of arrow
- B. Shoot three arrows
1. Consistent aiming point
 2. Consistent anchor
- C. Chase group center with pin
1. Low arrow: lower pin
 2. High arrow: raise pin
 3. Left arrow: move pin left
 4. Right: move pin right
- D. Repeat trial and error until arrows hit where aimed.
- E. Mark tape for distance and archer
- F. Repeat for other distance

EMPHASIZE the need for tight groups in order to properly adjust sights. ASK – how do the anchor point and the eye form a rear shift. DEMONSTRATE sight adjustment and the change impact point. STRESS importance of using the same aiming point and good groups.

DEMONSTRATE bows with different types of sights.

III. Sight Selection

- A. Target sights
1. Extended sight bar
 2. Long sight radius
- B. Hunting sights
1. Single pin
 2. Multiple pins
 3. Lighted pin.
 4. Tree-stand sights

DISCUSS reasons for the single pin and the long sight radius.

EMPHASIZE precise aiming

DISCUSS advantages and disadvantages of the various hunting sights.

ASK – why might you want a lighted pin or a special sight for shooting from the tree stands? NOTE need for consistent form that does not confuse the archer during a time when excitement may be high.

IV. Other gear

- A. Release aids
1. Clean release
 2. Extra equipment to carry
 3. Potential for errors
 - forgetting it
 - improper use
- B. Aperture sights
1. Precise aiming
 2. Better scores
 3. Loss of light
 4. Conclusion during shot
- C. Other gear and gadgets.

DEMONSTRATE the use of a mechanical release and DISCUSS the advantages and disadvantages of releases.

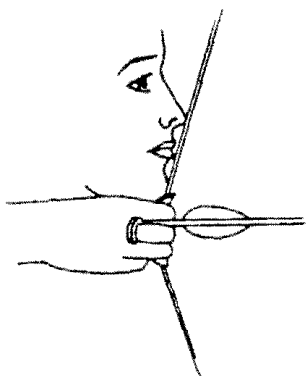
Have archers who use them or who have quit using them discuss topic.

ASK why an archer might use a string peep in field shooting or hunting.

DISCUSS some possible advantages and disadvantages.

DISCUSS and DEMONSTRATE additional items of your choice.

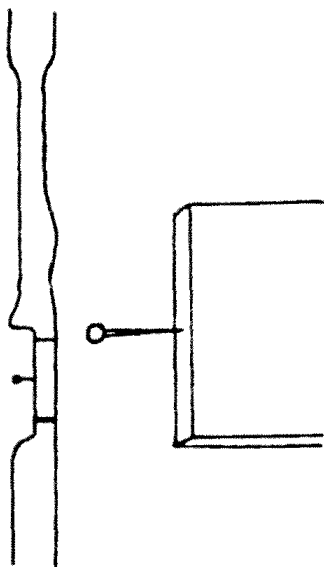
Lesson Narrative



Fundamentals of Sight Shooting

The fundamentals of shooting with sights are the same as for any other type of archery. Although they are the same, most archers change anchor points when shifting from instinctive to sight shooting. Usually the new anchor point is below the chin. This raises the rear sight (the eye), giving the archer more room in the sight window to adjust the front sight. Hunting archers sometimes keep the high anchor because it is familiar and they shoot at short distances. Target archers competing in USAA or FITA events usually cannot set their sights for longer distances without using the low-anchor point.

The string should touch the center of chin (that is why many chins are slightly cleft - to accept a properly drawn bowstring), the center of the lips and the tip of the nose. The string is drawn to the center of the chin with the head raised very slightly. Then the chin is lowered under the string and meets the other two anchor checkpoints. As with instinctive shooting, the ideal position for the drawing arm places the forearm in direct line with the shaft. On release, fingers of the drawing hand should flow backward along archer's throat and side of the neck. Other form elements are like those in previous sessions. Be sure you check each other on following the basics.



Making a Simple Sight

Elaborate and expensive sights can be used, but a good teaching sight can be made from masking tape, duct tape or weather stripping foam and a dressmaker's pin. Pins with enamel heads in white, yellow, orange or red are easy to see and use. Stick a strip of tape or foam on the back of the bow at the sight window. Stick the pin into the foam or under the tape, leaving the enamel head in the sight window. A good starting point places the pin about the same distance above the arrow rest as the eye is above the anchor point. The head of the pin should stick out into the sight window about as far as the edge of the arrow is from the dominant eye, about 1.5 centimeters (3/4 inch) This arrangement should place the arrows close to the point of aim at close range (15 to 25 yards). The sights can be adjusted by trial and error to place the group center on the point of aim.

Adjusting the Sights

When adjusting rifle sights, the rear sight is moved in the direction the hits are to move. In contrast, archers adjust the front sight. In front sight adjustment, chase the point of impact with the sight.

Before making adjustments, the archer must know where the arrows are hitting relative to the point of aim. That means that the ability to shoot tight groups is essential. A minimum of three arrows should be shot to establish the point of impact. Use the same sight setting, anchor point and point of aim. If the sight setting places the first arrow completely off the butt or target and your form was good, adjust the sight after that arrow to get on the target. Using the "chase the arrows with the pin" approach, move the sight to the left if the hits are to the left, upward if they are high, and so forth. With the simple tape and pin sight, adjustments may need to be made by trial and error. With sights having a screw adjustment, **windage** (lateral right or left) adjustments can be aided by counting the number of turns in any given change and noting the resulting change. Then calculate the approximate number of turns needed to reach the desired setting. That reduces the amount of trial and error during the beginning stages of sight set-up.

Once the sights are set to your satisfaction, mark the pin and the tape with the distance and your initials. Ideally, every archer should have a personal bow for this exercise. Several archers can use a single bow if different pin colors are used. Repeating the entire process for each distance desired will have the bow set up for the shooting situations you are using. The rest is up to the archer and adequate practice.

Using Sights for Targets and Hunting

Using sights for either target shooting or hunting involves the same principles, but with some practical differences. Target archers often extend the sight out from the back of the bow, giving themselves a longer sight radius. The longer sight radius aids in precision sighting. Almost all target archers use a single sight pin that is adjustable for elevation with marked locations on the sight bar for different distances. Where permitted, they may use aperture rear sights known as **string peeps**, levels or other devices to aid in precision sighting. Some field archers use similar techniques.

Most field archers and hunters use slightly different techniques. The extended **sight bar** is used much less frequently, particularly by hunters. The improvement in sighting precision does not equal the disadvantages in the field. The longer sight bar is easily entangled in vegetation, and the sight is much more prone to damage or being knocked out of adjustment in field handling. Many archers in these sports opt for a protected sight with a guard to protect the pin or pins. Considerable difference of opinion exists among hunters and field archers about the number of pins that should be used. Some use multiple pins that are color coded and pre-set for selected distances. Others use a single pre-set pin and hold over or under targets at other distances. Those using multiple pins like the precision of holding the pin on the point of aim after selecting the proper pin for the distance. Those using a single pin feel it is less confusing and requires the same amount of accuracy in judging distances. Generally,

more experienced hunters choose the single pin, while target archers who do a considerable amount of shooting use multiple pins and often a string peep.

Other Gear

An aperture rear sight or string peep can improve sighting precision. The string peep can force an archer to develop consistent form in some phase of shooting. String peeps may make sighting more difficult under low light conditions, and they may require one-eyed shooting for some archers. Under FITA rules they are not legal on recurve and/or long bows.

Release aids are popular with many archers. The mechanical release has several advantages. They produce a clean release with a single point of contact with the string. They may help archers attain consistent form if the drawing hand position or finger tension is a problem. Those who elect not to use a release often look at the device as excess baggage or another artificial element in archery shooting. Others find them confusing or fear they might release a shot unintentionally. The best advice for young archers is to keep your shooting as simple as possible while learning. Once the fundamentals are established with and without sights, the archer can experiment with other devices and styles.

Summary Activities

1. Use coach-pupil method to check shooting form and sight adjustment on the range.
2. Let participants set the sights on their bows for the type of shooting and distances used. Consider types of shooting the archer is planning to do when selecting a sight combination.
3. Illustrate and demonstrate sight correction procedures and proper adjustment of sights.
4. Hold a club shoot with courses of fire appropriate for skill levels of the participants. Use a handicapping system or some other type of grouping to make sure the archers compete on an equal basis.
5. Hold a novelty shoot where archers can use sights if they desire.

Exhibit and Sharing Ideas

1. Make a model or illustration and discuss arrow trajectory using personal equipment or that provided in the program. (See *Fact Sheet 5: Trajectory and Trajectory Experiments*.)
2. Display targets shot using instinctive and sight shooting techniques. Compare advantages and disadvantages in your journal.
3. Exhibit a model, poster or diagram of proper sight shooting form or sight adjustment. Explain the processes on labels or in your shooting journal.

Shooting Compound Bows

Ronald A. Howard Jr. *

Objectives

Participating youth and adults will:

1. Understand the functioning and variety of compound bows.
2. Be able to select compound bows to fit their uses.
3. Be able to match archery equipment for optimum performance.
4. Develop shooting skill with compound bows.
5. Have fun while learning.

Roles for Teen and Junior Leaders

- Demonstrate use of bows.
- Demonstrate trajectory curves.
- Aid archers with equipment.
- Serve as assistant range officers or line captains.
- Score targets.

Parental Involvement

- See Roles for Teen and Junior Leaders above.
- Conduct shooting demonstrations.
- Arrange or coordinate transportation.
- Arrange or provide refreshments.
- Assist in record keeping, scoring or range management.

Best Time to Teach

Any time after basic shooting form with and without sights has been developed

Best Location

Combination of classroom or quiet instructional area and safe shooting range.

Time Required

1 hour

Materials/Equipment

- various compound bows (wheels, cams, cam limbs, overdraws, fast-flight systems)
- archery accessories
- personal shooting equipment
- target butts
- targets

References

- Hunting with Easton Aluminum Shafts.*
Easton Aluminum, Van Nuys, CA.
- Target Shooting with Easton Aluminum Shafts.* Easton Aluminum, Van Nuys, CA.
- National Archery Association Instructor's Manual*, third edition.
P. Baler, J. Bowers, C.R. Fowkes and S. Schoch. National Archery Association
- Fact Sheet 5: Trajectory and Trajectory Experiments.* Bow or arrow manufacturer's catalogs, advertising materials and owner's manuals may also prove useful.

* Texas 4-H and Youth Development Specialist, Texas Agricultural Extension Service.

Presentation

I. Evolution of archery tackle

- A. Bow materials
 - 1. Wood
 - 2. Composites
 - 3. Fiberglass
 - 4. Glass composites
 - 5. Graphite and boron
- B. Bow styles
 - 1. Longbow
 - 2. Reflex
 - 3. Recurve
 - 4. Compound

II. Compound bow

- A. Basic parts
 - 1. Riser or handle
 - 2. Limbs
 - 3. Wheels or cams
 - 4. Cables
 - 5. String
- B. Compound bow advantages
 - 1. Mechanical advantage
 - relaxation at full draw
 - ease of holding anchor
 - redistributing draw force
 - 2. Increased energy transfer
 - greater energy recovery
 - higher arrow speed
 - reduced arrow stress
- C. Compound bow disadvantages
 - 1. More moving parts
 - noise
 - complex tuning
 - possible damage
 - 2. Aesthetics
- D. Comparison of compound types
 - 1. Wheels
 - multi-wheel bows
 - two-wheel bows
 - 2. Cams
 - 3. Cam limbs
 - 4. Overdraws

Teaching Outline Application

DISCUSS changes in archery equipment over time.

EMPHASIZE the similarity in functions and recent advances in archery engineering. DEMONSTRATE materials if available.

DEMONSTRATE bows or show illustrations of various designs.

POINT OUT parts of a typical compound bow.
ILLUSTRATE several types if possible.

DIAGRAM draw force curves of various bow types.
ASK participants to discuss some advantages and disadvantages of the various types. SUPPLY any basic elements they miss.

COMPARE draw force curves, energy transfer and shooting “feel” of wheel, cams and cam limbs.

DISCUSS and ILLUSTRATE overdraw use and need for very consistent form.

- arrow mass and speed
- flatter trajectory
- sensitivity to form
 - pivot point of bow and arrow not the same
 - exaggeration of errors
- minimum arrow mass of six grains per pound of draw weight

III. Shooting compound bows

- A. Basic shooting form
- B. Extra noise sources
 1. String noise
 2. Cable noise
 3. Rest noise
 4. Axle noise
- C. Equipment safety precautions
 1. Mismatched equipment
 2. Damaged equipment
- D. Trajectory comparison
 1. Relationship of velocity and trajectory
 - acceleration of gravity
 - time in flight
 2. Flatter trajectory increases ability to hit
 - reduced demand on range estimation
 - quicker flight time

ASK archers to REVIEW the basic elements of good shooting form.

DEMONSTRATE ways of reducing noise levels.

STRESS the potential danger of mismatched equipment and the need to inspect for damage.

Have an archer or assistant SHOOT compound and recurve bows of like draw weight using similar arrows and arrows matched to the bows.

SUMMARIZE findings and use of compound bows.

Lesson Narrative

Although the fundamentals of archery have remained the same, archery equipment has changed a great deal in recent years. Centuries ago archers used self bows, bows made from a single stave of wood. Some bows were reinforced with sinew, horn, bone or other materials; but native woods were the main bow materials. Designs varied in both shape and length. The long, straight or slightly reflexed English long bow was quite different from the short, recurved bows used by the Mongols and the Turks. The function of the bow was reflected in its form.

As composite materials, like fiberglass, were developed, they found use in the bowyer's trade. Laminated limbs, recurved designs and the use of stiffer, stronger materials increased bow cast and speed. The compound bow introduced a major change in bow design. The use of eccentric wheels and cables altered the mechanics of drawing the bow. That eased the drawing process and reduced the force needed to hold the bow at full draw. The mechanical advantage also allowed more of the energy stored during the draw to be transferred to the arrow during the shot. The result was a faster arrow at the same draw weight. Also, the less abrupt, longer acceleration reduced stress on the arrow. This made the use of lighter, "softer" spined arrows possible, adding to the increased speed. Archers, particularly bowhunters, were quick to take advantage of the new technology.

Recent years have seen further advances. Development of better materials, like graphite and boron fiber composites, has added stiffness to limbs with reduced limb mass. Design changes, like the introduction of timed cams or cam limbs, have increased speed and/or "feel" for archers. As a result, the modern archer has choices that were beyond the dreams of archers only decades ago.

Basic Compound Bow Design

Compound bows and "stick" bows have the same basic components. Both have limbs, riser, handle, arrow shelf, arrow rest, arrow plate, a sight window and a string. Compound bows also have cables and eccentric wheels of some sort to provide the mechanical advantage. The cables transfer the drawing forces to the limbs, which are usually shorter and stiffer than those of recurve bows. The eccentric wheels or cams alter the shape of the draw force curve. It changes from one that rises uniformly or increases in slope with increasing draw length to a fiat-topped curve with two "valleys" - one at the resting state and the other at full draw. That change is the key to the efficiency of the compound bow.

Compound bows have several advantages over recurve bows of similar draw weight. First, they transfer a greater proportion of stored energy to the arrow. More work done in drawing the arrow to the anchor point and bending the limbs becomes kinetic (moving) energy in the arrow.

Secondly, the reduced stress on the arrow permits the use of a lighter arrow with less spine. That, too, increases arrow speed. Finally, fatigue-induced errors in shooting form may decrease because of reduced holding weight. Hunting archers find this an advantage when waiting at full draw for their quarry to move into a better position.

Disadvantages of the compound bow arrow related to their moving parts or the same features that yield advantages. Reducing the holding weight, for example, makes variations in release more critical. Relatively minor errors may produce serious changes in arrow flight. The bow's mechanics require a more complex tuning process and cause more difficulty in noise reduction. In addition, the extra moving parts and the greater stress placed upon the limbs, cables, strings and other bow parts increase the potential for breakage during use. Compound bows tend to be heavier than recurve bows of the same draw weight. The increased weight may make them more stable, but it may add to fatigue as well. Many archers feel that the mechanical appearance of the compound bow makes it ugly, too. Beauty, it seems, remains in the eye of the beholder.

Wheeled bows, those with round eccentrics, and bows with cam limbs tend to have smoother draw force *than* cam bows. Cams store more energy and shoot faster arrows than wheels, however.

The quest for more arrow speed has produced further technical changes in bow design. Overdraws, devices that shorten the draw length from rest to anchor point, permit the use of a shorter, lighter and softer spined arrow. At full draw the tip of the arrow is actually located inside the handle (and the bow hand) of the bow. The Archery Manufacturer's Organization (AMO) recommends a minimum arrow weight of six grains per pound of draw weight for safety. Increases in speed are offset somewhat by the demand for greater consistency in shooting form. Since the arrow rest is not directly over the pivot point of the bow, small changes in bow-hand position can cause substantial changes in impact location. Bow-hand form is critical when using an overdraw. Arrow speed cannot compensate for poor form.

Shooting Compound Bows

Compound bow shooting uses the same basics of form used in shooting recurve bows. Compound bows are less forgiving of form faults, so consistent form is essential to precise shooting. Poor form results in more noise, erratic grouping of arrows and faster arrows hitting in the wrong places. Extra care with form and equipment is necessary. The rest is practice, practice, practice.

Summary Activities

1. Have each archer try a variety of compound bow types to compare the performance and "feel. "

2. Have each participant practice shooting a compound bow of their choice until they are proficient.
3. Have a participant shoot a compound bow with several different arrow weights to see the impact on arrow speed and accuracy.
4. Have each participant select and set up a compound bow for target or hunting purposes.

Exhibit and Sharing Ideas

1. Display a model or diagram of a compound bow labeling all its functioning parts.
2. Compare trajectories of several bows with equal draw weights but different designs. Present the results as graphs and discuss them in your notebook or put them in poster form. Sample targets may be included.
3. Make a compound bow from a kit and display your finished bow.
4. Exhibit a series of targets illustrating a change in skill level using a compound bow.
5. Complete a trajectory experiment as outlined in the *Fact Sheet 5: Trajectory and Trajectory Experiments*. Exhibit the results of your experiment in an appropriate form with full documentation in your shooting journal or notebook.
6. Exhibit an item you have made for use with compound bows, for example, a bow scale, string jig, compound bow stringer, bow rack or similar item of your choice

Bow Tuning

Ronald A. Howard Jr. *

Objectives

Participating youth and adults will:

1. Understand the principles of bow tuning.
2. Set up a bow for their shooting style and purposes.
3. Understand relationships among various bow tuning factors.
4. Have fun while learning.

Roles for Teen and Junior Leaders

- Assist participants with interpreting bow tuning situations
- Demonstrate tuning problems and solutions.
- Supervise range use and operation.

Parental Involvement

- See Roles for Teen and Junior Leaders above.
- Arrange for or provide transportation to the range.
- Arrange for or provide refreshments.
- Reinforce tuning solutions at home.

Beat Time to Teach

When participants are ready to switch from a learning bow to a personal bow, and after sound basic shooting form with and without sights has been achieved

Best Location

Anywhere with access to a suitable indoor or outdoor range

Time Requires

20 to 90 minutes

Materials/Equipment

- nocking point indicators or dental floss
- nocking point pliers
- bow square
- felt-tip pen
- strings of various lengths
- variety of arrows (lengths, diameters, spines, weights) equipped with screw-in adapters
- points of different weights and types
- adjustable side plate, cushion plunger or thin leather
- Barge cement
- target and butt (foam, pressed sugar cane or excelsior preferred)
- Allen or hex wrenches
- spray foot powder
- moleskin
- string silencers
- bow stringers

References

- Bowhunting with Easton Aluminum Arrow Shafts.* Easton Aluminum, Inc., Van Nuys, CA.
- Target Archery with Easton Aluminum Arrow Shafts.* Easton Aluminum, Inc., Van Nuys, CA.
- National Archery Association Instructor's Manual*, third edition. P. Baler, J. Bowers, C.R. Fowkes and S. Schoch. National Archery Association, Colorado Springs, CO. 1982.
- Archery: Steps to Success.* K.M. Haywood and C.F. Lewis. Leisure Press, Champaign, IL. 1989.
- Teaching Archery: Steps to Success.* K.M. Haywood and C.F. Lewis. Leisure Press, Champaign, IL. 1989.

* 4-H and Youth Development Specialist, Texas Agricultural Extension Service.

Teaching Outline

Presentation

I. Importance of tuning equipment

- A. Balance and adjustment
- B. Effects on performance
 1. Accuracy
 2. Success in shooting
 3. Safety
- C. Typical tuning elements
 1. Arrow characteristics
 - shaft stiffness or spine
 - diameter
 - wall thickness
 - weight
 - shaft length
 - point mass
 - fletching
 - type
 - style
 - amount
 2. Bow characteristics
 - nocking point location
 - arrow plate location
 - plate or plunger tension
 - feather or vane clearance
 - noise reduction

II. Matching shafts to archers

- A. Archer's paradox
 1. Differs with purpose
 2. Spine changes with length
- B. Selecting length
 1. Differs with purpose
 - Target arrows cut to actual draw length
 - Hunting arrows cut slightly long
 2. Spine changes with length
 - Shorter arrow stiffer than longer one of same diameter
 - ratio of diameter to length important

Application

ASK – why do you think it could be important to have archery equipment properly tuned? SEEK answers that cover the range of reasons for tuning.

ASK – what parts of each bow and arrow combination should be considered in balancing and tuning your equipment to meet your shooting purposes?

DISCUSS all responses and ADD any that might not have been considered

NOTE that every combination of archer, bow, arrow and other equipment tends to alter the tuning at least slightly.

INTRODUCE the notion of the archer's paradox: arrows have to bend in order to fly straight.

ASK why having arrows too long or too short might not be wise. DISCUSS all answers, referring back to first lessons.

Using a draw-check arrow, have each pair of archers record their actual draw length.

DEMONSTRATE by having a volunteer attempt to bend two pieces of thin dowel. ASK – why the short one is harder to bend. NOTE that the same applies to arrow shafts.

- relate findings to spine chart
- 3. Speed and momentum change with length
 - mass increases with length
 - more energy needed to accelerate greater mass
 - momentum the product of mass and velocity.
- C. Selecting stiffness
 1. Using selection guides
 - draw weight
 - shaft length
 - choices of shafts
 - diameter
 - wall thickness
 - material
 2. Relationship to length
 3. Relationship to point mass
 4. Influence of style and form
- D. Effect of spine variation
 1. Deviation to bow-hand side
 - too stiff
 - improper bow set up
 - shooting form
 2. Deviation to string-hand side-too soft
 - improper bow set up
 - heavy arrowhead
 - shooting form

III. Fletching and points

- A. Purpose
 1. Assist in flight control
 2. Provide stability
- B. Fletching types
 1. Feathers
 - more resistance
 - more forgiving
 2. Vanes
 - less affected by weather
 - less drag – faster
 - more sensitive to changes in release

ASK participants which they can throw farther – a baseball or a lead ball of the same size? DISCUSS the reasons.

PROVIDE and have young people STUDY a shaft selection chart. NOTE that several weights or diameters of shafts may be listed for a given draw weight and length.

POINT OUT that bowhunters may prefer too stiff a shaft to one that is too soft, BUT personal shooting style and other factors have a strong influence. URGE each one to experiment until they find the optimum shaft for their bow, purpose and shooting style.

ILLUSTRATE the effects of these factors by having an assistant shoot several groups using carefully selected shafts. CAUTION: *do not use excessively soft shafts in heavy bows, they may shatter under pressures!*

USE an arrow for a visual aid. ASK – what purpose the fletching serves.

DEMONSTRATE and DISCUSS the types and styles of fletching material available.

LEAD young people in considering the facts in selecting paper fletching type and styles for some selected purposes

C. Styles and amount

1. Styles

- spin wings
- straight fletch
- offset fletch
- helical fletch
- flu-flu fletching
- others

2. Materials

- soft or stiff plastics
- feathers
- fur

3. Amounts

- adequate for task
 - small amounts for light target shafts
 - larger ones for heavy hunting shafts
 - extreme amount to limit flight
- balancing speed and control
- personal preference and style

D. Points

1. Form follows function

- mass
 - target only
 - practice for hunting
- shape
 - conical
 - bullet
 - field point
 - broadhead
 - blunt
 - other types

DISCUSS trade-offs in speed and control, using specific situations as examples.

PASS AROUND samples of different fletching materials for close up observation.

USE arrows for different purposes as examples to start s DISCUSSION of this topic.

Have a leader SHOOT several styles under different conditions to show effects or DISCUSS their reasons for choosing a given style, type and amount.

IV. Tuning considerations for bows

A. Nocking point location

1. First adjustment for vertical flight stability
2. Too low or too high causes porpoising or planing
3. Typically about 9 millimeters (3/8 inch) above arrow rest
4. Placement more critical when shooting broadheads

DISPLAY and DISCUSS several types of heads.

DISCUSS advantages and disadvantages of the various shapes and the reasons for more weight in heads used for hunting practice.

DEMONSTRATE the influence of moving the nocking point too high or too low by moving the arrow on the string. DISCUSS the critical placement of nocking points with broadheads.

DEMONSTRATE the bare shaft method of adjusting this feature.

5. Bare shaft correction method
- B. Arrow plate thickness or cushion plunger adjustment
 1. Second adjustment for horizontal flight stability
 2. Errors cause fishtailing
 3. Bare-shaft method
 4. Other instructions for tuning
 - manufacturer
 - good manual or text
- C. Checking arrow clearance
 1. Shaft or vanes striking bow during shot may cause poor shooting
 2. Adjust for clearance with cushion plunger, arrow plate or change in peak weight
 - string-hand side – too stiff or peak weight low
 - bow-hand side – too soft or peak weight high
 3. Re-check for fishtailing after checking clearance

V. Basic bow tuning

- A. Select appropriate shaft size and length
- B. Select appropriate fletching
- C. Tune for vertical stability (getting rid of porpoising)
- D. Tune for horizontal stability (getting rid of fishtailing)
- E. Tune for clearance (re-check horizontal tuning afterward)

DEMONSTRATE this feature using a cushion plunger, adjustable arrow plate or thin layers of leather or moleskin. DEMONSTRATE the bareshaft method and PASS OUT samples of bow or cushion plunger tuning directions from archery manufacturers.

SPRAY foot powder on the riser near the arrow rest to DEMONSTRATE ways of checking for vane clearance.

SUGGEST a workshop on bow tuning (at this time or later) to adjust personal equipment for optimal performance.

Lesson Narrative

Archery equipment must be properly tuned if an archer is to enjoy accurate, successful and safe shooting. Tuning involves balancing the bow with the other equipment used, adjusting the bow for optimum performance and adapting the equipment to the archer's shooting style. The fundamentals of proper shooting form must have been mastered to a reasonable degree, with the archer capable of shooting group successfully. Tuning involves factors of both the arrow (material, thickness, diameter, weight, length and attachments) and the bow (nocking point location, plate or plunger adjustment and arrow rest performance).

Arrow Selection

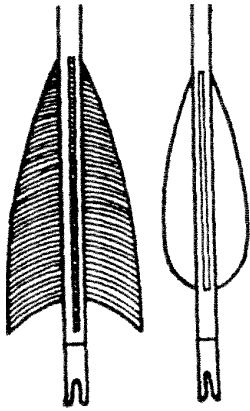
Typically, tuning starts with selection of arrows. Arrows should be matched to the bow carefully, and to each other. High quality arrows are extremely consistent from shaft to shaft and are straight. Spine or stiffness of the arrow is the most vital factor in good performance. Spine is a dynamic and complex feature of arrow behavior. It involves the type of arrow material, shaft length, shaft diameter, wall thickness, structure and mass of the arrow and its attachments. The weight and structure of the arrowhead, the type of insert and the style and amount of fletching influence the spine to some degree.

The archer's paradox is that an arrow must flex to fly straight. The amount of flexing is critical to good arrow flight. Longer arrows of the same construction and size are "softer" than shorter ones, so arrow length influences stiffness. Target archers usually cut their shafts to their true draw length. Bowhunters usually cut the shafts 2 or 3 centimeters ($\frac{3}{4}$ to $1\frac{1}{4}$ inch) longer than the true draw length to keep the broadhead away from the back of the bow and their hand. Running a simple test or consulting a spine chart will confirm the relationship between length and stiffness.

Arrow weight, and therefore speed and momentum, are influenced by shaft length, too. The longer arrow has greater mass and inertia. Although it may have somewhat greater momentum, it is more difficult to propel at the same speed or velocity as a lighter shaft. Overdraws permit use of shorter, lighter, thinner shafts, achieving higher velocity while maintaining adequate spine for good performance in heavy bows. Shooting style, arrowhead mass and other factors can also be important. The archer must determine the best combination for his or her shooting style and equipment.

Shooting form, bow tuning (set-up) and arrow spine deviations can cause impact changes. Arrows that consistently hit on the bow-hand side may be too stiff if the other factors have been checked. Those that strike to the string-hand side are likely to be too soft, or the head is too heavy for the arrow spine. Bowhunters should be particularly cautious, since performance with heavy broadheads may be quite different from that seen with field points used in practice.

Fletching



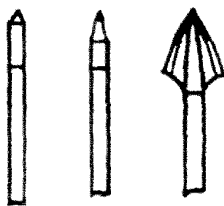
Fletching helps control the arrow in flight. The drag and spin provide stability to the shaft, although a properly tuned bow, should shoot bare shafts equally well at short ranges. The two primary fletching materials used today are feathers (primarily domestic turkey feathers) and plastic vanes. The former are cut to length and burned to shape. The latter come in hard and soft materials, a variety of styles and thicknesses and a pre-cut or cast shape. In general, feathers offer more control. Archers speak of them as being "more forgiving of minor form faults. At the same time, feathers are much more affected by weather and susceptible to wear. Vanes are more "slippery" in the air. They may increase arrow speed slightly, but at the cost of being less forgiving of shooting form faults. They are also much more resistant to weather changes.

The amount of fletching required depends on use of the arrow. Normally flight arrows have the smallest amount of fletching. Target arrows are next. Hunting arrows usually have very large areas of fletching to guide the heavy arrows under uncertain conditions. Target archers may be satisfied with three 2- to 3-inch vanes; or they may opt for more flight stability with "spin wings," a thin, curled type of vane. Hunting archer or field archers usually use four 4-inch vanes or three 5-inch ones to adequately control the heavy arrows in heavy bows.

Fletching may be applied in line with the shaft {straight fletch}, slightly offset or in a spiral {helical fletch}. These styles are listed in decreasing order of speed and increasing order of control or stability. Selection of a fletching style involves trade-offs between speed and control. Usually the choice in style reflects personal experience and preference.

Some archers use strips of brightly dyed rabbit fur at the back of their fletching to increase their ability to follow the arrow. Others use either spirally wound feathers or six full-length feathers to control the cast of the arrow. These **flu-flu arrows** are used in shooting at flying targets or small game and game birds.

Point Selection



Arrowheads come in a wide array of types and styles. Target points are no longer limited to the traditional short, sharply pointed cone. **Bullet-shaped points** are now preferred by many archers because they tend to be deflected less when they strike another arrow in a tight group. Each archer should try these styles of points to see which one they prefer personally. Traditional **field points** now have shorter or longer tips, and may even resemble an elongated bullet point. As with the target points, the archer should examine and experiment to find the ones that perform optimally for them. **Broadheads** come in so many styles and types that they can be confusing. NO hunting broadhead should be barbed. Broadheads should meet

these four criteria: razor sharp, tough enough to withstand impact with bone or the ground, large enough to be legal and make an adequate wound channel, and true and consistent in flight.

Archers will find uses for other types of heads as well. **Judo heads** or those of similar design are outstanding for roving. **Blunts** are used for small game. **Snaro heads** may be used for flying game. Look at an archery catalog and see which types you might want to try. Remember, size and mass of the head will affect arrow performance tuning considerations. While the target archer may want to tune specifically for target shooting, the bowhunter may want to tune for the broadhead of choice, selecting practice points that mimic their broadhead's performance.

Tuning Your Bow

Three major factors need to be considered when tuning bows for optimal performance. These factors are vertical stability (porpoising or planing), horizontal stability (fishtailing) and clearance. In general, it is wise to tune the bow in the order stated

Porpoising may be caused by shooting faults as well as by improper location of a nocking point. An arrow that oscillates up and down in flight shows porpoising. Bowhunters may refer to the same situation as "planing." Moving the nocking point up or down slightly will usually correct the situation. As a starting point, locate the nocking point about 9 millimeters ($\frac{3}{8}$ inch) above true perpendicular. Using a target at relatively close range (about 15 meters or 15 yards), shoot three bare shafts and three fletched ones using the same aiming point. If all six arrows are in the same group, the nocking point is correctly situated. If the two groups are not together, move the nocking point slightly in the direction of the bare shafts and repeat the test. Once you have located the nocking point indicator properly, note it in your journal and mark your bow square as a reference for later use.

Fishtailing is a lateral (side to side) oscillation in arrow flight. It may be caused by shooting form faults, as well as improper tuning. Tuning to eliminate fishtailing involves adjusting either the tension on a cushion plunger or the amount of "center shot" on the bow. Initially, the string and arrow should bisect the limbs on a recurve bow and be approximately 3 to 4 millimeters ($\frac{1}{8}$ to $\frac{3}{16}$ inch) into the sight window on a compound bow. Using the same bare-shaft technique outline above and following the instructions with your cushion plunger if one is installed) or your bow manufacturer, adjust the arrows for straight flight. If the bare shafts are to the bow-hand side of the fletched ones, decrease the tension on the cushion plunger or move the side plate closer to the bow. If the bare shafts are to the string-hand side of the fletched ones, increase the tension or move the side plate out from the bow. If major adjustments are necessary, it may indicate that the arrows are improperly spined for the bow. Arrows are too stiff will impact to the bow-hand sided. Those that are too soft will impact to the string-hand side. In general, if you can adjust the two groups to within approximately 10 centimeters (4 inches) of each other at 12.5 meters (15 yards) then spine is within acceptable limits for good arrow flight.

Clearance adjustment is designed to eliminate contact between the arrow and the bow during a shot. Power applied to the fletched end of the arrow and the area on either side of the arrow rest can leave tracks of any impact. If moving the pressure point in or out slightly does not correct the problem, a change in spine may be needed. If the nock end hits the riser beyond the arrow rest, increase the spine or the length of the pressure point. If the shaft is hitting the riser on the inside of the arrow rest, it may be too stiff for the bow set up. Any time a clearance adjustment is made, adjustment for horizontal stability or fishtailing should be rechecked.

Basic bow tuning is a complex process, but one that can be mastered using a step-by-step procedure. First, you need to determine your draw length and the appropriate shaft size at that length. Next, select a fletching style and amount that fit your needs. Third, the bow should be tuned for vertical stability by adjusting the nocking point. Next, tune for horizontal stability. Then, check the set up for clearance. After these factors have been set, a final check of all equipment should be made. The rest is up to you.

Summary Activities

1. Have each archer tune his or her bow in a clinic setting.
2. Have assistants or archers fire groups and let the participants analyze what tuning considerations should be made. If possible, include some form or dominant eye faults to challenge them.

Exhibit or Sharing Ideas

1. Illustrate tuning problems and correction with a series of targets or illustrations.
2. Give a demonstration on tuning a bow for performance.
3. Examine the physics of arrow performance and discuss the importance of tuning to achieve optimum performance.

ARCHERY ESSENTIALS

HAVE RANGE SET-UP BEFORE STUDENTS ARRIVE, POST RANGE RULES, HAVE EQUIPMENT READY, BLANK TARGET

- 1) Safety Orientation Class
 - a.) Eye Dominance
 - b.) Jewelry, Long Hair, etc.
 - c.) Enter Range: Range Officer (**Orange CAP and Orange Vest**)
 - d.) Hand out Equipment (Except for Bows)
 - 1) Arm Guard, Finger Tab or Glove
 - 2) Quiver
 - 3) Measure Archers for Arrows (**3 Arrows** in Quiver)
 - e.) Explain **Safety Rules, Whistle Commands, Range Procedures & Pulling Arrows** as a Group on Waiting Line
 - f.) Demonstration (Group on Waiting Line)

During the demonstration, instructor names & points out bow and arrow parts necessary for youth to understand essential terms for those first shots. This would include the Eleven Steps To The Ten Ring.

 - 1) Shooting
 - a. Stance & Posture
 - b. Nock Arrow
 - c. Set Hook
 - d. Set Bow-Hand Grip
 - e. Raise & Extend Bow
 - f. Draw
 - g. Anchor
 - h. Aim
 - i. Release
 - j. Follow Through
 - k. Relax & Evaluate
 - 2) Dropping Arrow
 - 3) Retrieving Arrow
 - 4) Pulling Arrow
 - 5) Lost Arrow (Arrow Top of Target Butt)
 - 6) Carrying Arrows
 - g.) **Safety** Reminders
 - 1) Always Keep Arrows Pointed Down Range
 - 2) Only Shoot Target In Front Of You
 - h.) Select Bow (Safety: **NO DRY FIRING**)
 - 1) Flight 1 – Select Bows
 - a) Archers Shoot First End of 3 Arrows (1st Arrow with Instructor)
 - 1) Pull Arrows (Range Officer Last to Walk Back)
 - 2) Flight 2 – Select Bows, Shoot Pull Arrows
 - 3) ETC.

THE ELEVEN STEPS TO THE TEN RING

1) Stance & Posture

- a) Place one foot on each side of shooting line.
- b) Find a comfortable balanced stance with feet shoulder width apart.
- c) Stand straight, keeping ribs and chest down, and bottom tucked under.
Keep shoulders down and relaxed.

2) Nock Arrow

- a) Place arrow on arrow rest, holding arrow close to nock.
- b) Keep index fletching pointing away from bow.
- c) Snap nock of arrow onto bowstring under nock locator.

3) Set Hook

- a) Set first groove of first three fingers around the bowstring under the arrow nock creating a hook.
- b) Keep back of drawing hand flat and relaxed.
- c) The thumb and pinky should be tucked away.

4) Set Bow-Hand Grip

- a) Position the bow-hand on the bow grip by making a Y with the fingers and thumb.
- b) The knuckles of the fingers should be positioned at a 45 degree angle and the thumb pointed towards the target.

5) Raise & Extend Bow

- a) Raise bow arm and string hand together towards the target, while keeping shoulder down and aligning chest perpendicular to target.
- b) Drawing arm should be near level of nose.
- c) Bow arm should be rotated so it is straight up and down.

6) Draw

- a) Draw the string back in a straight line from raising and extending bow (step 5) to the side of the face anchor point.
- b) Set drawing arm shoulder back and down until elbow is directly behind or a bit higher than arrow.

7) Anchor

- a) Draw string to side of face placing tip of first finger on corner of mouth.
- b) Keep hand snug against face folding thumb down and little finger towards palm.

8) Aim

- a) Look at target or through sight, keeping focus on form.
- b) Focus on the point of aim if not using sight.
- c) If using sight then focus on the point you want to hit.
- d) Keep string lined up with center of bow.

9) Release

- a) Release all tension in fingers and drawing hand, all at once, while continuing to draw bowstring back without stopping.
- b) Continue bow arm towards target.
- c) Continue focusing on target.

10) Follow Through

- a) The drawing hand should continue back beside neck with fingers relaxed and ending up behind the ear.
- b) Keep bow arm up.
- c) Maintain follow through until arrow hits target.

11) Relax & Evaluate

- a) Relax after each shot.
- b) Evaluate the feeling of each shot to determine if you accomplished the goal you were trying to achieve.
- c) If not, you should refocus your efforts on the feeling of the proper shot and try again.