

NOT JUST KNOTS

Name: _____ Age (as of January 1 of the current year): _____

County: _____ Club Name: _____ Advisor: _____



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES



AUTHORS

Glenn Dickey, Member, International Guild of Knot Tyers, North American Branch; and Volunteer, 4-H Youth Development, Ohio State University Extension

John Dickey, Member, International Guild of Knot Tyers, North American Branch; and Volunteer, 4-H Youth Development, Ohio State University Extension

Kathy Mann, former Program Coordinator, Department of Food, Agricultural and Biological Engineering, The Ohio State University

REVIEWERS

Monroe Harbage, Vocational Agriculture Teacher and Extension Educator (Retired), Agriculture and Natural Resources, Ohio State University Extension

Randall Reeder, Faculty Emeritus; Department of Food, Agricultural and Biological Engineering; College of Food, Agricultural and Environmental Sciences, The Ohio State University

Kameron Rinehart, Member, Youth Curriculum Committee, 4-H Youth Development, Ohio State University Extension

PRODUCTION TEAM

Brian Deep Art & Design LLC, designer

Heather Gates, Technical Editor, Marketing and Communications, The Ohio State University, College of Food, Agricultural and Environmental Sciences

Kelly Tomkies, Freelance Editor

Jane Wright, Curriculum Manager, 4-H Youth Development, Ohio State University Extension

Susie Young, Assistant Editor, 4-H Youth Development, Ohio State University Extension

For more knot knowledge from author Glenn Dickey, including links to helpful websites, please visit morethanknots.com.

Photo credits:

Glenn Dickey: pages 10, 11, 17 (top), 19 (top and bottom), 21 (left), 35, 37 (completed fisherman's knot), 41 (A, B, C, and D), 51 (knotboard), 52 (knotboard).

Tim Bowman: pages 13, 16, 18, 20, 22, 24, 28, 30, 32, 34, 36, 40, 42, 44, 46.

National 4-H: page 52 (boy with goat).

All other photos from Thinkstock.com.



This project book demonstrates adherence to the highest educational standards within 4-H.

Copyright © 2016, The Ohio State University

Ohio State University Extension embraces human diversity and is committed to ensuring that all research and related educational programs are available to clientele on a nondiscriminatory basis without regard to age, ancestry, color, disability, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, race, religion, sex, sexual orientation, or veteran status. This statement is in accordance with United States Civil Rights Laws and the USDA.

Roger Rennekamp, Associate Dean and Director, Ohio State University Extension

For Deaf and Hard of Hearing, please contact Ohio State University Extension using your preferred communication (e-mail, relay services, or video relay services). Phone 1-800-750-0750 between 8 a.m. and 5 p.m. EST Monday through Friday. Inform the operator to dial 614-292-6181.

7/17—1.3M—GLOBUS



CONTENTS

Notes to the Project Helper.	2
Member Project Guide.	3

Project Area: Knot Basics

Activity 1: Types of Cordage	8
Activity 2: Parts of Cordage	12
Talking It Over.	15

Project Area: Simple Knots

Activity 3: Overhand Knot	16
Activity 4: Square Knot	18
Activity 5: Bowline Knot	20
Activity 6: Figure 8 Knot	22
Activity 7: Alpine Butterfly Knot	24
Talking It Over.	26

Project Area: Bends

Activity 8: Sheet Bend	28
Activity 9: Sheepshank	30
Activity 10: Anchor Bend	32
Activity 11: Carrick Bend	34
Activity 12: Fisherman's Knot.	36
Talking It Over.	38

Project Area: Hitches

Activity 13: Half Hitch.	40
Activity 14: Round Turn and Two Half Hitches.	42
Activity 15: Clove Hitch	44
Activity 16: Rolling Hitch.	46
Talking It Over.	48

Project Area: Capstone Project

Activity 17: What I've Learned	50
Glossary	53
Answer Key.	55
References	56
Summary of Learning Outcomes.	57



NOTES TO THE PROJECT HELPER

Congratulations! A 4-H member has asked you to serve as a project helper. You may be a parent, relative, project leader, friend, club advisor, or another person important in the 4-H member's life. Your duties begin with helping the youth create and carry out a project plan, as outlined in the Member Project Guide. This is followed by helping the youth focus on each activity, providing support and feedback, and determining what was done well, what could have been done differently, and where to go next.

As a project helper, it is up to you to encourage, guide, and assist the 4-H member. How you choose to be involved helps to shape the 4-H member's life skills and knowledge of the importance of cordage and knot-tying.

YOUR ROLE AS PROJECT HELPER

Your contributions are critical to delivery of the 4-H program, which is committed to providing experiences that strengthen a young person's sense of belonging, generosity, independence, and mastery. Your interactions should support positive youth development within the framework of the Eight Essential Elements:

1. A positive relationship with a caring adult
2. An inclusive environment
3. A safe emotional and physical environment
4. Opportunity for mastery
5. Engagement in learning
6. Opportunity to see oneself as an active participant in the future
7. Opportunity for self-determination
8. Opportunity to value and practice service to others

For more information on the Eight Essential Elements, please refer to the *Volunteer Handbook* available online at ohio4h.org. In addition, on a practical level, your role as a project helper means you will ...

- Guide the youth and provide support in setting goals and completing this project.
- Encourage the youth to apply knowledge from this project book.
- Serve as a resource person.
- Encourage the youth to go beyond the scope of this 4-H project book to learn more about knot-tying and rope.

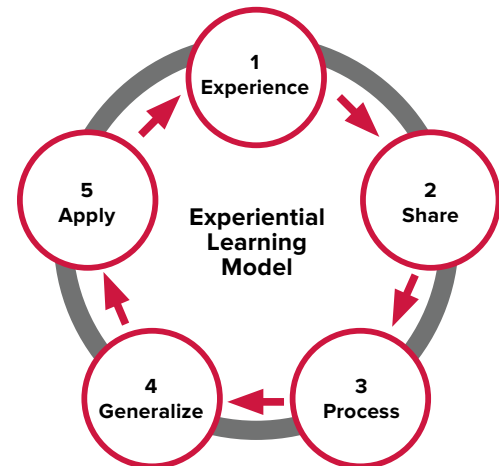
Learning to tie knots requires patience and practice. You can help by acknowledging your 4-H member's efforts and by providing lots of encouragement.

WHAT YOU CAN DO

- Review the Learning Outcomes (project skill, life skill, educational standard, and success indicator) for each activity to understand the learning taking place. See the inside back cover for the Summary of Learning Outcomes.
- Become familiar with each activity and the related background information. Stay ahead of the learner by trying out activities beforehand.
- Begin the project by helping the learner establish a plan. This is accomplished by reviewing the Member Project Guide.
- After each project area is completed, conduct a debriefing session that allows the learner to answer the review questions and share results. This important step improves understanding from an experiential learning perspective.
- Help the learner celebrate what was done well and to see what could be done differently. Allow the learner to become better at assessing his or her own work.
- In the Member Project Guide, date and initial the activities that have been completed. Each knot-tying activity asks the member to mark the activity as completed only when he or she can tie the knot without looking at the step-by-step directions. It is likely the 4-H member will be asked to demonstrate this ability during judging.

WHAT YOU SHOULD KNOW ABOUT EXPERIENTIAL LEARNING

The information and activities in this book are arranged in a unique, experiential fashion (see model). In this way, a youth is introduced to a particular practice, idea, or piece of information through an opening (1) experience. The results of the activity are recorded on the accompanying pages. The youth then takes the opportunity to (2) share what he or she did with his or her project helper, (3) processes the experience through a series of questions that allows him or her to (4) generalize, and (5) apply the new knowledge and skill.



Pfeiffer, J.W., and J.E. Jones, *Reference Guide to Handbooks and Annuals*. © 1983 John Wiley & Sons, Inc. Reprinted with permission of John Wiley & Sons, Inc.



MEMBER PROJECT GUIDE

Welcome to *Not Just Knots!* You are about to learn 14 basic knots, bends, and hitches that can be used in many activities and situations, from sailing and climbing, to working with animals and decorating. This is going to be a lot of fun, and we're *knot* kidding!

Each year the *Not Just Knots* project is taken, you can choose a final, or capstone, project to demonstrate your new tying skills. If you take *Not Just Knots* more than once, be sure to select a new capstone project that demonstrates new and different knowledge and skills.

Not Just Knots is designed for 4-H members of all ages and skill levels. This project can easily be completed in one year, although younger members may decide to do it in two. Youth with more experience can repeat this project as long as they can demonstrate new knowledge and skills.

As you complete the activities in this book, you will notice that some knots are known by many names. It is helpful to know a knot's various names so that, when you run across them in other books and other situations, you know the knot being talked about. *The various names are included for your reference, not because you are required to memorize them.*

Check your county's project guidelines (if any) for completion requirements in addition to the ones below, especially if you plan to prepare an exhibit for the fair.

Making each knot and learning about it will take from 30 minutes to an hour, depending on how easy it is for you to follow the steps. The secret to *really* learning them—to memorizing them—is to practice. Every time you start a new knot, see if it helps to start by tying all the ones that have come before. Good luck!

This is the _____ (first, second, third, etc.) time I have taken this project.

SAFETY PLEDGE



Handling rope can be dangerous. Rope that is incorrectly handled or tied can burn, injure, or even kill people and animals. Read the paragraph below. After discussing rope safety with your project helper, sign and date where indicated.

I pledge to handle rope and other cordage carefully, never using it to tie a person in any way. I will be especially careful of limbs, including arms and fingers, which can easily become caught in coils and small loops. When working with rope that is under great tension, I will use gloves and avoid wrapping a rope around my hand for a better grip. I will seek the appropriate training, equipment, and expertise before using any of the knots, bends, or hitches in this book for caving, climbing, sailing, or other activities with potential risk. In other words, I agree to use the knowledge and skills gained through completing the Not Just Knots project to make the best better.

Signature of 4-H Member: _____ Date: _____

Signature of Project Helper: _____ Date: _____



PROJECT GUIDELINES

Step 1: Complete **all 17** activities, and **all** of the Talking It Over questions.

Step 2: Take part in **at least two** learning experiences.

Step 3: Become involved in **at least two** leadership/citizenship activities.

Step 4: Complete a project review.

STEP 1: PROJECT ACTIVITIES

Complete **all 17** activities and **all** of the Talking It Over questions. The More Challenges activities are optional. As you finish activities, review your work with your project helper. Then ask your project helper to initial and date your accomplishments.

Activity	Date Completed	Project Helper Initials
Project Area: Knot Basics		
1. Types of Cordage		
2. Parts of Cordage		
Talking It Over		
Project Area: Simple Knots		
3. Overhand Knot		
4. Square Knot		
5. Bowline Knot		
6. Figure 8 Knot		
7. Alpine Butterfly Knot		
Talking It Over		
Project Area: Bends		
8. Sheet Bend		
9. Sheepshank		
10. Anchor Bend		
11. Carrick Bend		
12. Fisherman's Knot		
Talking It Over		



Project Area: Hitches		
13. Half Hitch		
14. Round Turn and Two Half Hitches		
15. Clove Hitch		
16. Rolling Hitch		
Talking It Over		
Project Area: Capstone Project		
17. What I've Learned		

STEP 2: LEARNING EXPERIENCES

Learning experiences are meant to complement project activities, providing the opportunity for you to do more in subject areas that interest you. What are some learning experiences you could do to show the interesting things you are learning about? Here are some ideas:

- Attend a clinic, workshop, demonstration, or speech related to knot-tying and rope.
- Help organize a club meeting based on this project.
- Go on a related field trip or tour.
- Prepare your own demonstration, illustrated talk, or project exhibit.
- Participate in county judging.

Once you have a few ideas, record them here. Complete **at least two** learning experiences. Then, describe what you did in more detail. Ask your project helper to date and initial in the appropriate spaces below.

Plan to Do	What I Did	Date Completed	Project Helper Initials
<i>Demonstration</i>	<i>Showed club members how to tie five simple knots.</i>	<i>5/5/YR</i>	<i>J.D.</i>



STEP 3: LEADERSHIP AND CITIZENSHIP ACTIVITIES

Choose **at least two** leadership/citizenship activities from the following list (or create your own) and write them in the table below. Record your progress by asking your project helper to initial next to the date each one is completed. You may add to or change these activities at any time. Here are some examples of leadership/citizenship activities:

- Teach someone about knot-tying and rope.
- Help another member prepare for his or her project judging.
- Host a workshop to share tips about knot-tying and rope.
- Encourage someone to enroll in the knot project.
- Arrange for a rope and knot-tying speaker to visit your club.
- Plan your own leadership/citizenship activity.

Leadership/Citizenship Activity	Date Completed	Project Helper Initials
<i>Organized a club field trip to a rock climbing gym. Learned about the types of rope and knots climbers use to stay safe.</i>	6/12/YR	J.D.



ACTIVITY 1: TYPES OF CORDAGE

Words in **bold** are located in the glossary.

Nowadays, instead of using the word *rope*, people who **knot** say **cordage**. You'll soon discover that cordage is made of a wide variety of materials. **Natural** fibers used for cordage include **cotton, sisal, jute, coir,** and **hemp**. Man-made, or **synthetic**, materials are also popular. Let's take a look.

WHAT TO DO

Visit a hardware store and compare four different kinds of cordage. Find four that seem really different. As you examine each one, fill out the chart below. Some information you are looking for may appear on the cordage label.

Cordage material	Natural or synthetic?	How is it made?	What does it feel like? What is the texture?	Does it stretch? (Y/N)	Would it be good for this project?
<i>paracord</i>	<i>synthetic</i>	<i>braided with inside cord</i>	<i>smooth</i>	Y	Y

LEARNING OUTCOMES

Project Skill: Identifying different types of cordage

Life Skill: Processing information

Educational Standard: NT.K-12.1, Basic Operations and Concepts: Students demonstrate a sound understanding of the nature and operation of technology systems.

Success Indicator: Identifies different types of cordage



BACKGROUND

Cordage materials have evolved over time. Natural fibers have been used in cordage for thousands of years. Man-made synthetic fibers are relatively recent.

NATURAL	Cotton	A soft, usually white, fluffy material that is made from the hairs around the seeds of a tall plant related to mallows; in knotting, cotton cordage is typically easy to handle and knots very well.
	Jute	A glossy fiber made from either of two Asian plants that is used mainly for making sacks and twine; knots very well, but because of its short fibers it is not very strong.
	Sisal	A strong, white durable fiber produced from the leaves of the agave plant and used as cordage and twine; a good choice for general-purpose twine.
SYNTHETIC	Polypropylene/polyethylene	A flexible and lightweight man-made fiber that is very economical for general-purpose rope. Polypropylene/polyethylene typically floats and is resistant to rot, oil, water, gasoline, and most chemicals.
	Polyester	A strong, man-made fiber made from polymers that are popular in marine and other industries where stretch is not desired. Polyester cordage is typically resistant to wear, sun damage, rot, oil, gasoline, and most chemicals.
	Nylon	A strong, man-made fiber known for its flexibility and ability to absorb shock. It lasts four to five times longer than natural fibers. Nylon cordage is typically resistant to wear, sun damage, rot, oil, gasoline, and most chemicals. SAFETY NOTE: When used under tension, such as a tow rope or mooring line, nylon cordage stretches and snaps back when the tension is released. Take extra precaution when using nylon cordage under tension, or consider using another material.

MORE CHALLENGES

A way to test whether a cord is synthetic or natural is to burn the end. Purchase a small piece of each cordage you wrote about in your chart. *With your helper*, burn one end of each to see what happens. Cordage made from natural fibers burns easily. Cordage made from synthetic fibers melts and even fuses. Are any of them a combination? Document and share what you learn.



HOW CORDAGE IS MADE

Spun or twisted strands of fiber create cordage. Why? This is important: Combining the strands helps to increase the strength of the cord. There are four ways this is done.

1. **Laid.** Three or more strands are twisted in the direction opposite the direction of the twist in the strands. In other words, it is twisted and counter-twisted.
 - Hard laid: Greater tension is applied during twisting, making a stiff, less flexible rope that wears better.
 - Soft laid: Little tension is applied during twisting, making a floppy and flexible rope that is preferable for tying knots.
2. **Braided.** Single strands braided together. An eight- or 16-braid is more flexible and stretches less than laid rope. Braided rope does not kink or twist. Most braided cordage is part of a sheath and core construction. Braid-on-braid rope is known to be the strongest rope.
3. **Plaited.** Twisted strands braided together. Combines eight or 16 strands, normally of nylon material and woven in pairs.
4. **Sheath and core.** Climbing ropes are also called sheath and core.
 - Sheath: Protector of the core; the thicker the sheath, the more protection it provides to the core. It provides a small amount of strength.
 - Core: Individual pieces of yarn or rope bundled to form the core. The core is where the rope gets the majority of its strength and ability to absorb shock.



This natural fiber cordage is three-stranded and right laid. Each strand has many fibers.



This synthetic sheath and core rope has an outer sheath, an inside paper core, and an inner core of individual fibers.



Paracord is made with a braided sheath and a core of twisted strands.

WHAT CORDAGE DO I NEED FOR THIS PROJECT?

All you need to complete the activities in this project are two pieces of clothesline-type cordage, each about 3 feet long and $\frac{1}{4}$ inch (6 mm) in diameter. You can use other cordage, but cotton or synthetic clothesline is especially easy to handle and control. It is also inexpensive and readily available.







HOW DO I KEEP MY CORDAGE FROM UNRAVELING?

No matter what kind of cordage you use, it will last longer and your knots will look better if you finish the ends. The method you use depends on the material, as shown in the table below. If you decide to use heat to finish the end of your cordage, do so only with your project helper.

DID YOU KNOW?

As a general rule, a cord that is twice the diameter of another is four times stronger.

Method	Material	Process
WHIPPING		
Sisal with an end whipped with cotton string.	Use on cotton, manila, sisal, and other natural materials	Wrapping and securing small cordage like string, twine, or whipping cord around an end of larger cordage.
		
FUSING		
Paracord with a fused end.	Use with polypropylene, polyethylene, polyester, and nylon	Using either a flame or tool like a hot soldering iron, gently heat the end of the cordage until it melts.
		
GLUING		
Cotton clothesline with a glued end.	Use on small cordage	Before cutting the cordage, either dip the area you wish to cut in glue or apply glue to the area. Let dry, then cut. The glued spot will prevent the cord from unraveling.
		
TAPING		
Three-stranded cotton with a taped end.	Use on any cordage of any size as long as tape holds it securely	Using a strong tape, such as electrical tape, wrap both sides of the area you wish to cut with several turns of the tape. Cut the cordage in the middle of the area. Using this method, you can finish two ends of cordage with one taping.
		



SUMMARY OF LEARNING OUTCOMES

ACTIVITY	PROJECT SKILL	LIFE SKILL	EDUCATIONAL STANDARD*	SUCCESS INDICATOR
Project Area: Knot Basics				
1. Types of Cordage	Identifying different types of cordage	Processing information	NT.K-12.1, Basic Operations and Concepts: Students demonstrate a sound understanding of the nature and operation of technology systems.	Identifies different types of cordage
2. Parts of Cordage	Uses correct terminology to identify basic cordage parts	Visualizing information	NT.K-12.1, Basic Operations and Concepts: Students demonstrate a sound understanding of the nature and operation of technology systems.	Uses correct terminology to identify basic cordage parts
Project Area: Simple Knots				
3. Overhand Knot	Tying and understanding the use of an overhand knot	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties an overhand knot
4. Square Knot	Tying and understanding the use of a square knot	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a square knot
5. Bowline Knot	Tying and understanding the use of a bowline knot	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a bowline knot
6. Figure 8 Knot	Tying and understanding the use of a figure 8 knot	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a figure 8 knot
7. Alpine Butterfly Knot	Tying and understanding the use of an alpine butterfly knot	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties an alpine butterfly knot
Project Area: Bends				
8. Sheet Bend	Tying and understanding the use of a sheet bend	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a sheet bend
9. Sheepshank	Tying and understanding the use of a sheepshank	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a sheepshank
10. Anchor Bend	Tying and understanding the use of an anchor bend	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties an anchor bend
11. Carrick Bend	Tying and understanding the use of a carrick bend	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a carrick bend
12. Fisherman's Knot	Tying and understanding the use of a fisherman's knot	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a fisherman's knot
Project Area: Hitches				
13. Half Hitch	Tying and understanding the use of a half hitch	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a half hitch
14. Round Turn and Two Half Hitches	Tying and understanding the use of a round turn and two half hitches	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a round turn and two half hitches
15. Clove Hitch	Tying and understanding the use of a clove hitch	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a clove hitch
16. Rolling Hitch	Tying and understanding the use of a rolling hitch	Mastering technology	NT.K-12.1, Basic Operations and Concepts: Students are proficient in the use of technology.	Ties a rolling hitch
Project Area: Capstone Project				
17. What I've Learned	Planning and completing a capstone project	Planning and organizing	NT.K-12.1, Basic Operations and Concepts: Students demonstrate a sound understanding of the nature and operation of technology systems.	Plans and completes a capstone project
*The educational standards cited here are from the Standards for Students from the International Society for Technology in Education (2007). These are available in their entirety by clicking on Standards at iste.org/resources .				

