Educator Guide

Information that is helpful for using this activity as an educator

- Activity at a glance
- About the kit, viewing answer key, purchasing kits, and more

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Activity at a glance

Time to complete	Approximately 1-1.5 hours
Age level	Advanced high school, College, or Professional school
Bloom's level(s)	• BL3 - Apply • BL4 - Analyze • BL5 - Evaluate
Learning objective	After completing this activity, students will be able to **interpret** (BL3 - Apply) the motions of their own knee, **simulate** (BL5 - Evaluate) each motion axis of the knee with a 3D physical model, and **diagram** (BL4 - Analyze) the knee's 3D axes of motion as a 2D representation.
Assessment	• **Students:** Students can assess their own work on page 1 and the first row of page 2 of the worksheet using "Assess" boxes in the activity guide. • **Educators:** Educators can assess students' work for rows 2-4 on page 2 of the worksheet using the answer key (only visible to educators).
Materials needed	See Materials needed
Systems	• Skeletal
Core concepts	• ??Structure & function
Competencies	• Depiction of anatomy • Integration of 2D and 3D representations • Motion analysis • Observation

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Activity ID	HSKN2

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About the kit, viewing answer key, purchasing kits, and more

Why was this kit developed?

The Human Knee Active Learning Kit is a life-size and fully functional reproduction of a real knee designed by 3D Anatomy Studios to engage learners in a deeper understanding of knee structure and function through hands-on activities.

Who made this kit?

The Human Knee Active Learning Kit was designed by 3D Anatomy Studios founder Aaron Olsen, PhD. Aaron is a professional anatomist and designer who has published several peer-reviewed articles on the form, function, and evolution of vertebrates and has taught comparative vertebrate anatomy at the University of Chicago and human gross anatomy at the University of Chicago's Pritzker School of Medicine and Brown University's Warren Alpert Medical School. The kit was designed in the open-source 3D modeling program Blender using public domain data from the NIH Visible Human Project. Every kit is made by hand at the 3D Anatomy Studios workshop in Portland, Oregon.

When was this kit made?

Initial development of the Human Knee Active Learning Kit began in late 2024. Prototypes were exhibited at the Society for Integrative and Comparative Biology annual meetings in January 2025 and January 2026 and the first commercially available version of the kit was completed in May 2026.

Where was this kit made?

The design process for the Human Knee Active Learning Kit began in Pawtucket, Rhode Island (where 3D Anatomy Studios was located prior 2026) and completed in Portland, Oregon (where 3D Anatomy Studios moved in January 2026). As far as manufacturing, although we source the component parts (screws, 3D printer filament, ropes, straps, etc.) from various suppliers, we do all of the remaining manufacturing work (3D printing, cord cutting and preparation, paper part printing and lamination, assembly, etc.) ourselves at our workshop in Portland, Oregon.

Pawtucket, Rhode Island was once heavily populated by the Pokanoket and Nipmuc tribal nations as well as the Narragansett, Niantic, and Manissean who are the ancestral habitants of

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the land we now call Rhode Island. Portland, Oregon was once heavily populated by the Multnomah, Wasco, Cowlitz, Kathlamet, Clackamas, Chinook, Tualatin, Kalapuya, Molalla, and numerous indigenous peoples who, for millennia, made their homes along the river basin we now call the Columbia River. We acknowledge the Indigenous peoples who have inhabited and continue to inhabit these lands on which we live and work and we honor with gratitude their historical and cultural relationship to the land.

Where did the anatomical data come from?

The anatomical data used to build the kit were sourced exclusively from the Visible Human Female of the NIH Visible Human Project. These data were first released into the public domain in 1995. Because these data are in the public domain, they can be used for any purpose, including commercial use. Hard tissue data (i.e., bones) were segmented from CT scans and soft tissue data (i.e., muscles, tendons, ligaments, cartilage, etc.) were segmented from cryosection image stacks. All segmentation was performed using the open-source software 3D slicer. Meshes were exported from 3D Slicer and mesh face counts were reduced using the open-source software MeshLab, before importing meshes into Blender.

How is the kit licensed? Can I copy the kit?

3D Anatomy Studios asserts copyright over the Human Knee Active Learning Kit, covering all aspects of the kit design, including packaging, that represent creative expression, beginning with its initial design in 2025. This grants 3D Anatomy Studios exclusive rights to reproduce, distribute, display, or adapt the kit. If you'd like to request permission to reproduce, distribute, display, or adapt the Human Knee Active Learning Kit, please email us at contact@3danatomystudios.com. Requests that are non-commercial may be granted at no cost; commercial requests may require a licensing fee. Please note that while 3D Anatomy Studios asserts copyright over the kit itself, the activity guides for the kit are released with a CC NC-BY-SA license.

How can I use the kit?

The Human Knee Active Learning Kit is designed for hands-on, interactive learning in multiple contexts:

- **Students in human anatomy or biomechanics courses** can use the kit in a lab setting either as a station (set up by an educator) or on their own for self-guided learning by following any of the available activity guides.
- **Educators teaching human anatomy or biomechanics** can use the kit in a lecture or lab setting to demonstrate knee form and function, muscle coordination, and joint biomechanics, using the available activity guides as a reference, to help prepare a

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demonstration, or to help set up a station.
- **Clinicians working with patients who have knee injuries** can use the kit with patients to clearly explain how the knee works, how the patient's knee was injured, and the reasoning behind a particular course of treatment without needing to use complicated jargon, using the available activity guides as a reference and for assembly and disassembly instructions.
- **Clinical educators in the fields of sports medicine and orthopedics** can use the kit to demonstrate to students and trainees in the healthcare profession the complex mechanics of the knee and the effects of particular injuries through knockout experiments, using the available activity guides as a reference and for assembly and disassembly instructions.
- **Physical therapists working specifically with high-performing athletes** can use the kit to help athletes understand how to improve their performance and reduce the risk of injury, using the available activity guides as a reference and for assembly and disassembly instructions.

How are the activity guides structured?

Every activity guide for the kit follows the same structure:

- **Activity Guide:** A step-by-step guide through the activity with hints, self-assessments, and a worksheet. This can be used by students for self-guided learning or by educators and clinicians as a reference.
- **Activity as a Station:** Materials that educators can use to set up the activity as a station, such as in a lab setting, including an instruction sheet and a modified worksheet ideal for use as a station.
- **Educator Guide:** An overview of the activity for educators and answer key.

How do I view the answer keys?

The activity answer keys will only be visible to logged in users who have been given educator permissions and have purchased one or more Human Knee Active Learning Kits. Once you've been granted access, you can find the answer keys in the "Educator Guide" section of each activity. If you've purchased one or more kits, you should have received an email to access your Educator account. If you need us to resend this email or have any other issues accessing your account, please email us at contact@3danatomystudios.com.

Can I share and/or edit the activity guides?

All of the activity guides for the kit are released under a CC NC-BY-SA license. This allows you to share and edit this module as long as you (1) do not sell the module or module derivatives ("NC"), (2) attribute the author(s) of all the content, including preserving text and graphic

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attributions ("BY"), and (3) share the module under the same license ("SA").

How were these activity guides made?

These activity guides were created by professional anatomists and educators at 3D Anatomy Studios using the open-source wiki software Bookstack. You can see the author of each activity by seeing who it was created by (on the main page of the activity). The guides are all hosted online at the domain guides.3das.us, which is maintained by 3D Anatomy Studios.

Was AI (artificial intelligence) used to make these guides?

No. *None* of the content on this site (text, images, videos, etc.) was generated by AI.

How can I purchase kits?

To purchase Human Knee Active Learning Kits, please send us an email at contact@3danatomystudios.com.

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