

Title: Reusable 3D pelvic floor teaching model for layered construction activities (Super-Models) 200/300

Date: 10/17/2026 - 10/23/2026

Client: Kelsey Henriquez

Advisor: Prof. David Dean

Team:

Katherine Ahlquist (kahlquist@wisc.edu) - Co-Team Leader

Sara Mlodik (mlodik@wisc.edu) - Co-Team Leader

Mina Hawkins (mjhawkins@wisc.edu) - Communicator

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Problem statement

The Physician Assistant anatomy curriculum currently has a pelvic floor anatomy workshop that uses a 2-dimensional paper template of the bony pelvis, on which PA students build pelvic floor musculature and tissues using colored Play-Doh. While the activity promotes hands-on learning, the 2D model does not adequately allow students to develop the three-dimensional spatial relationships required for future clinical practice. The client needs a classroom set of pelvic outlet models that accurately represent the normal adult pelvic anatomy, including anatomical landmarks for muscle and ligament attachment, that can serve as a stable scaffold for students to build pelvic floor musculature. It should be durable enough for repeated classroom use, easy to assemble and store, and allow Play-Doh or another inexpensive modeling material to be adhered and removed without causing residue or degradation.

Brief status update

This week, we met with Jesse Darley for a 3D-printing consultation, where he shared valuable guidance on materials, software, and ligament attachment methods. Building on his input, we made significant progress on our prototype's CAD model: we simplified the STL file, secured the coccyx, and added holes for the screws. We also met with our client to finalize the attachment sites and shapes of the muscles and ligaments. The 3D Pelvic Model was printed. Next steps are to attach the screws and coat the model with mod podge so it can be ready for Show and Tell October 30th.

On the ligament fabrication side, we created .svg vector files of the ligament shapes we plan to laser cut from neoprene. We made a test cut from chipboard to roughly estimate where the ligaments will sit on the 3D model. The sizing looks appropriate, especially given neoprene's ability to stretch.

Next week, we plan to finalize and order our materials, complete our initial CAD model, and meet with Jesse Darley again to review it. We also aim to 3D print at least one copy of the model for Show and Tell. Finally, each team member will complete their individual training and upload documentation to LabArchives before the October 30th deadline.

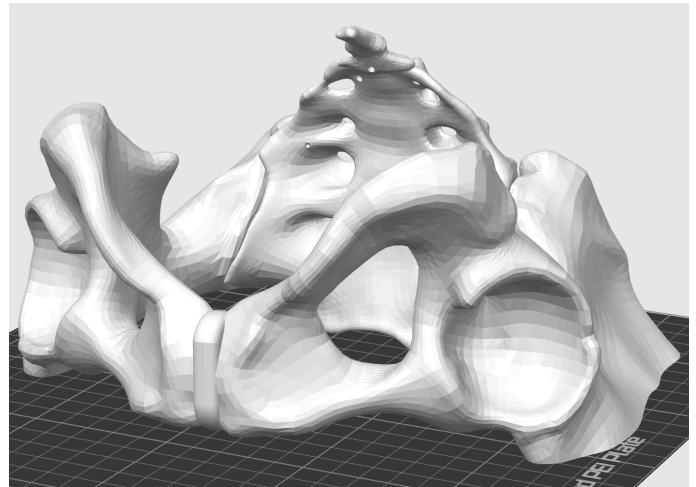
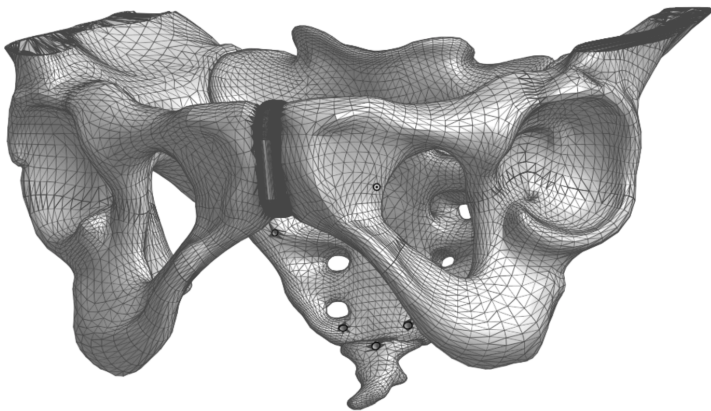
Difficulties / advice requests

For the Client:

We would appreciate it if you could review the ligament shapes we've designed (shown in the current design section) to make sure they meet your expectations.

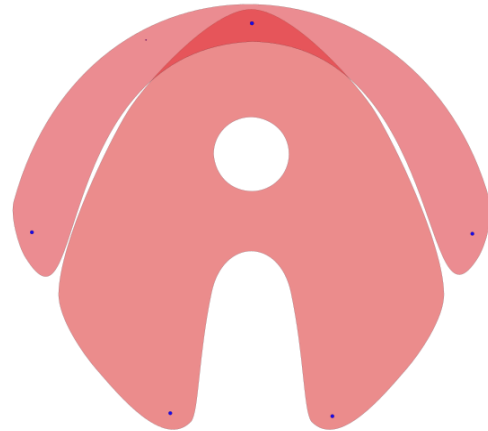
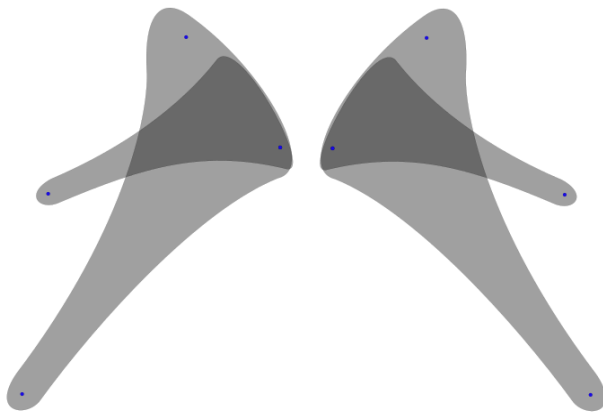
We are also considering engraving each ligament to indicate whether it belongs on the left or right side. Would you prefer the labels to follow the left and right sides of the patient's body, or the left and right sides from the physician's perspective? We are currently leaning toward the patient's body orientation, as that follows standard anatomical convention, but we want to confirm this matches how you plan to use the model.

Current Design



In the Pegs with Attachments design, there are 6 pieces total: a 3D printed pelvis, a flexible pelvic diaphragm, 2 flexible sacrospinous ligaments, and 2 sacrotuberous ligaments. The outer surface of the model will be coated with matte Mod Podge spray, allowing for better Play Doh adhesion onto the 3D printed surface. The pelvis is a simplified model, with the iliac crest sections superior to the proximal end of the sacrum removed. To allow the attachment of the diaphragm and ligaments, there are pegs on the pelvis surface. To address the lower longevity score, the attachment pegs will be metal semi-tubular rivets reinforced with adhesive to withstand repeated use without snapping under grip forces up to 624 N. Each rivet features an exposed neck for removable attachments and a stem deeply embedded into a matching socket and secured with cyanoacrylate adhesive to distribute lateral loads and prevent failure. Each of the flexible ligaments and diaphragm will have attachment holes at the ends with a wide and a narrow section to allow application and removal of the structures from the pegs. The diaphragm will be shaped like an 'X', having 4 attachment sites on each corner, as well as an inlet and a hole to allow students to scaffold the male or female anatomy. Finally, all structures will adhere to an average of male and female anatomical dimensions, creating a gender-neutral multi-piece pelvis model.

First prototype of musculature attachments:



[Sacrotuberous and Sacrospinous Ligament Dimensions](#)

[Levator Ani and Pubococcygeus Dimensions](#)

Materials and expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
3D-Printed Scaffold										
Main body of pelvic model	3D printed using PLA from the UW Madison Makerspace	UW Madison Makerspace	N/A	N/A	N/A	10/06.2026	30	8.05	241.5	N/A
Screws	390 screws needed for 30 models' ligament attachment sites.	MoyoCodi	PTZG03#312.	Amazon	PTZG03#312.	10/20/2026	4	3.99	16	link
Modpodge	The entire outer surface requires coating.	Modpodge	1469.	Amazon	1496	10/06.2026	3	10.18	30.54	Link
Pelvic accessories: Ligaments & Diaphragm										
Neoprene	Laser cut and used as ligaments	PerfectEx	N/A	N/A	N/A	10/19.2026	1	64.33	64.33	Link
Neoprene	Laser cut and used as ligaments	PerfectEx	N/A	N/A	N/A	10/19.2026	1	57.13	57.13	Link
Neoprene	Laser cut and used as ligaments	PerfectEx	N/A	N/A	N/A	10/19.2026	1	57.13	57.13	Link
	*Shipping not included yet *\$50 off makerspace							TOTAL*		\$466.63

Major team goals for the next week

- Finalize product and material design details based on 3D-Printing Consultation
- Have at least one functioning prototype for Show and Tell

- Calculate the specific costs of the required materials.

Next week's individual goals

- Katherine
 - Test out the chipboard cut out ligaments to the printed 3D model. Ensure the hole placements match between the model and the ligaments. Make shape/size/ hold placement adjustments to the vector file as needed.
 - Update the ligament files to include an engraving of "L" and "R"
 - Complete the CITI training
 - Guide Mina through the laser cutting process and how to create a Vector File of future designs.
- Sara
 - Continue creating alterations to the OnShape model to fix any inconsistencies after testing completions
 - Work alongside the team to decide on the final surface texture and hole geometry
 - Guide the team through the steps to begin a 3D print so that printing of the 30 models can begin
- Mina
 - Assist with any necessary ligament adjustments regarding shape, size, and hole location.
 - Learn about laser cutting from Katherine and become confident in the process.
 - Research and update clients on expense reimbursement.
- Abigail
 - Determine simple, cost-effective cleaning method for model
 - Assist with completion of final 3D CAD model of pelvis, begin printing process
 - Complete post-processing steps for any printed models
- Hiba
 - Complete in-person lathe and mill trainings
 - Research screw manufactures
 - Update estimated costs table
- Karen
 - Research neoprene sheets and find a cost-effective source.
 - Research self-tapping wood screws and find a cost-effective source.
 - Meet with Jesse Darley about our final CAD model
 - Finalize Materials and Expenses chart
 - Complete in-person lathe and mill trainings

Timeline

Task	Sept			Oct					Nov				Dec	
	11	18	25	2	9	16	23	30	6	13	20	27	4	13
Project R&D														
Empathize	x	x	x	x										
Background...	x	x	x	x										
Prototyping					x	x	x							
Testings							x							
Deliverables														
Progress Reports	x	x	x	x	x	x	x							
PDS		x	x	x	x	x	x							
Design Matrix			x											

Prelim Presentation				x										
Prelim Deliverables					x									
Show and Tell														
Final Poster														
Final Deliverables														
Meetings														
Client	x				x	x								
Advisor	x	x	x	x	x	x	x							
Website														
Update	x	x	x	x	x	x	x							

Filled boxes = projected timeline

X = task was worked on or completed

Previous week's goals and accomplishments

- Finalize product and material design details based on 3D-Printing Consultation
- Have at least one functioning prototype for Show and Tell
- Calculate the specific costs of the required materials.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Katherine	10/18	Begun Ink Scape shaping and played around on shape, learning the software and how to derive measurements.	1.5	7	28.25 hr
	10/19	Completed both the ligaments and muscle Vector files that can be used for laser cutting. Created document with dimension outlines for easy access for the rest of the team and continuity while fabricating the pelvic model. Updated Progress report with the new image renderings of the design.	4.5		
	10/22	While we wait for the neoprene to arrive, I laser cut a chipboard version of the ligaments to roughly estimate where they will sit on the 3D model.	1 hr		

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Sara	10/19	Altered the OnShape cutoff planes, adjusted OnShape hole locations, and	2	9.5	26.95 hr

		checked hole measurements with the ligament dimensions			
	10/20	OnShape troubleshooting and 3D printing consultation with Jesse	1		
	10/20	Completed alterations to the 'fixed' model: rotation, transformations, extruding parts with removal, and creating drafts	3		
	10/21	Started the first 3D print of the pelvis model, designing the print characteristics	1		
	10/22	Designed hole diameter and draft angle testing OnShape model and 3D printed the samples	1		
	10/22	Designed TPU testing OnShape model and 3D printed the samples	1		
	10/22	Creating pelvis surface textures and 3D printed the samples	0.5		
	10/23	Documented the protocols used for designing the TPU test, hole diameter test, and surface material test	2		

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Abigayle	10/17	Found a way to create a solid upper surface of the flat planes of the pelvic model	1	4	33.95 hr
	10/18	Research on ensuring inclusivity of ligament design for red-green color blindness	.5		
	10/20	Design consultation with Jesse regarding 3D print problems	1		

	10/22	3D-printed prototype post-processing, tree removal, initial play-doh adhesion/stability/cleanability testing and documentation	1.5		
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Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Mina	10/16/2026	Updated pelvic floor musculature and ligament drawings according to clients' feedback and researched colorblindness to aid in the color assignment of each neoprene component.	1.5	10.75	37.75
	10/17/2026	Used the updated STL file in onshape to find measurements between pelvic floor muscle and ligament attachment points.	1		
	10/18/2026	Team meeting to discuss materials.	1		
	10/18/2026	Created 2D line drawings of the pelvic floor muscles and ligaments to prepare for laser cutting.	2		
	10/20/2026	3D Printing Design Consultation with Jesse	.75		
	10/20/2026	In-person Lathe Training	2		
	10/21/2026	In-person Mill Training	2.5		

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Hiba	10/19	Machining Training lathe and mill	6.5	12.5	32.7
	10/17	Updated lab archives with meeting notes	1.5		
	10/17	Researched different manufactures	1.5		
	10/18	Team meeting to discuss materials to order	1		
	10/18	Updated cost table	1		
	10/21	Ordered materials	1		

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Karen	10/16	Researching Neoprene Sheets	1.5	12.75	34.75
	10/16	Updating progress report and team responsibilities	.75		
	10/18	Neoprene Research	1		
	10/18	Team Meeting - Materials	1		
	10/19	Calling Neoprene Manufacturer & Sending Email	1		
	10/20	Updating Progress Report	.25		
	10/20	3D Print Meeting with Jesse	.75		
	10/20	Lathe Training - In Person	2		
	10/20	Client + Vendor Emails	.75		
	10/21	Silicone / Neoprene Fabric Research	.5		
	10/21	Mill Training - In Person	2.75		
	10/22	Materials Research - Neoprene Fabric	.5		