

BME Design: Progress reports

VET Stand: Adjustable bite block assembly for radiation therapy for pet

Date: September 17, 2026 - September 24, 2026

Client: Dr. James Sohn

Advisor: Prof. Randy Bartels

Team Members:

Norah Greer (njgreer2@wisc.edu) - Co-Leader

Cole Hwang (nahwang@wisc.edu) - Co-Leader

Zhien Luo (zluo244@wisc.edu) - Communicator

Bridget Jensen - (bcjensen2@wisc.edu) - BSAC

Ethan Abitz - (eabitz@wisc.edu) - BWIG

Isabel Hillwalker - (hillwalker@wisc.edu) - BPAG

Problem statement

Veterinary radiation oncology requires dogs and cats to undergo sedation during every treatment session. A common tool used to secure an anesthesia delivery hose and hold the animal's head still is a bite block, however, common bite blocks are cumbersome and lack adjustability. This project aims to create an adaptable bite block with a wide range of widths and heights, allowing technicians to precisely and repeatedly position the block for each patient over multiple treatment sessions.

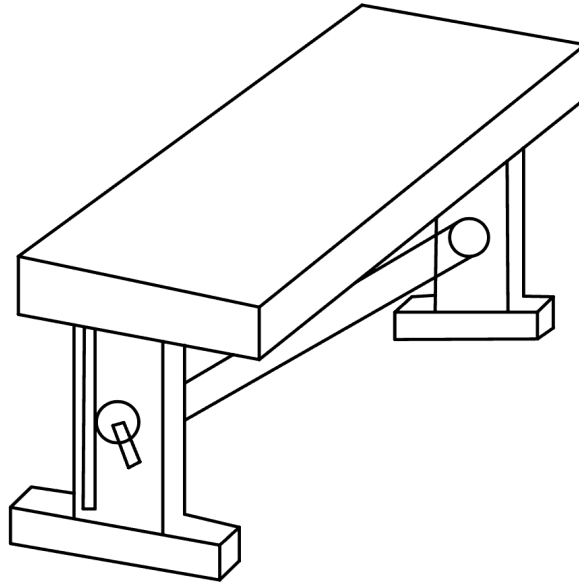
Brief status update

The team recently drafted a document that compared three design ideas for the adjustable stand part of the project. The team created 6 criteria with different weights to evaluate which design fits best with the client's requirements.

Difficulties / advice requests

None at this time

Current design



Materials and expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
									\$0.00	
									\$0.00	
Category 2										
									\$0.00	
									\$0.00	
								TOTAL:	\$0.00	

Goals

Major team goals for the next week

1. Present our current design to other BME design groups and get feedback
2. Update/improve our design with feedback
3. Start creating prototype in CAD

Next week's individual goals

- Norah Greer

- Work on preliminary presentation, take feedback from other BME groups to improve the design.
- Cole Hwang
 - Continue with research, start working on the preliminary design presentation, try building current design on solid works.
- Zhien Luo
 - Begin designing the actual product in CAD after approval from the client + advisor.
- Bridget Jensen
 - Look into materials to replace the dental putty with and prepare for the preliminary presentation
- Ethan Abitz
 - Work on preliminary presentation, adjust design based on client feedback, research mechanisms involved in design
- Isabel Hillwalker
 - Work on design matrix for bite block, research dogs' jaws and average sizes of dogs

Timeline

Task	Aug	Sep					Oct				Nov					Dec	
	31	7	14	21	28	5	12	19	26	2	9	16	23	30	3	10	
Project R&D																	
Empathize																	
Background...																	
Prototyping																	
Testings																	
Deliverables																	
Progress Reports																	
Prelim presentation																	
Final Poster																	
Meetings																	
Client																	
Advisor																	
Website																	
Update																	

Filled boxes = projected timeline

X = task was worked on or completed

Detailed accomplishments

Previous week's goals and accomplishments

- Norah Greer
 - Brainstorm designs, create criteria for design matrix, and evaluate designs
- Cole Hwang
 - Start design matrix, continue with researching and design ideas
- Zhien Luo

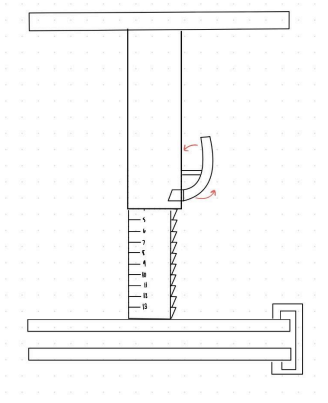
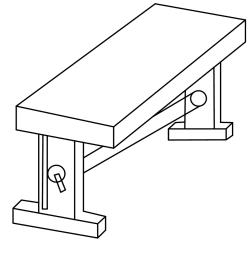
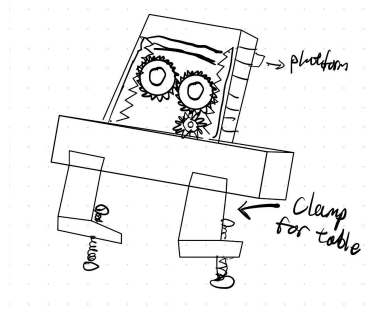
- Begin designing and fabricating ideas on the product itself. Alongside presenting design ideas to team.
- Bridget Jensen
 - Start creating design ideas, plan how to fabricate them, research more about the anatomy of a canines jaw.
- Ethan Abitz
 - Brainstorm design ideas, work on design matrix
- Isabel Hillwalker
 - Work on design matrix, research more about thermo plastics, create more designs

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Cole Hwang	9/21/26	Brainstorm ideas	.5	3	8
	9/22/26	Team meeting	2		
	9/24/26	Design Matrix	.5		
Norah Greer	9/20/26	Brainstorm/sketch design ideas	1	3.5	9
	9/22/26	Team meeting	2		
	9/23/26	Design matrix	0.5		
Ethan Abitz	9/21/26	Research/Brainstorming Designs	2	4.5	8.5
	9/22/26	Team Meeting	2		
	9/23/26	Design Matrix	0.5		
Zhien Luo	9/22/26	Team meeting	2	3	9
	9/23/26	Design Matrix	.5		
	9/24/26	Research	1		
Bridget Jensen	9/21/26	Brainstorm/sketch design ideas	1	3.5	9
	9/22/26	Team meeting	1		
	9/24/26	Design matrix	0.5		
	9/25/26	BSAC meeting	1		
Isabel Hillwalker	9/22/26	Team meeting	2	2.5	8
	9/23/23	Design Matrix Stand	.5		

Appendix

VET Stand: Adjustable Stand Design Matrix

Design						
Criteria (weight)	<i>Design 1: Lever Clamp Stand</i>		<i>Design 2: Rack and Pinion Stand</i>		<i>Design 3: Dual Rack and Pinion Clamp</i>	
Efficiency of Adjustment (25)	4	20	5	25	5	25
Precision (25)	5	25	4	20	4	20
Stability (15)	4	12	5	15	4	12
Safety (15)	3	9	4	12	5	15
Cost (10)	5	10	4	8	3	6
Durability (10)	4	8	4	8	4	8
Total (100)	84		88		86	

Design Criteria

Efficiency of Adjustment:

Efficiency of adjustment is how well the design is able to be adjusted. Specifically, the criteria was set by Dr. James Sohn, where we have to achieve a much faster time than the standard time to set up a Vet Stand (20 minutes). A setup time of roughly ~5 minutes should be aimed for.

The Rack and Pinion stand and Dual Rack and Pinion Clamp both received the highest score for this criterion, as they both contain an easy-to-use single-hand design to adjust the height of the Vet stand. Specifically, both designs allow the user to suspend the dog head in place while easily adjusting the knob of the stand to its desired height with ease. The Lever Clamp Stand received the lowest score of 20/25 as it requires two hands in order to push the button to allow it to extend higher or not, leading to lower efficiency and requiring multiple people to work.

Precision:

Precision refers to the design's ability to consistently get the same measurement when adjustments are made. This criteria was weighed very highly because having a precise measurement helps position the animal undergoing radiation therapy in the same place, making the radiation therapy more effective and safe.

The Lever Clamp Stand design received the highest score for this criteria as the design has teeth to mark different heights resulting in a consistent height measurement.. The Rack and Pinion Stand Design received a 4/5 because it is more difficult to replicate a measurement using a gears than stepped teeth, but the design involves a crank which makes it easier to mark different measurements in terms of rotations. The Dual Rack and Pinion Clamp Design also received a 4/5. This design also uses gears which adds difficulty as mentioned before, but the inclusion of different steps for different measurements makes this design a little more precise.

Stability:

Stability is the ability to measure how well the structure will hold its position under constant stress. The stand should not move once attached to the table, nor should it feel unsteady when adjusted by the Vet Tech. The device should maintain its position when adjusted.

The Lever Clamp and Dual Rack and Pinion Clamp Design both scored a 4. This is because the clamp gave them a more stable base structure; however, both only had clamps to keep them stable. Movement higher up the stand could loosen the clamps and make it unstable. The Rack and Pinion Design scored a 5 because it had two points of contact with the table, making it more stable than the other two designs with only clamps. The legs will help stabilize the stand because pressure will be put on both legs rather than just the clamps.

Safety:

Safety is the ability of the stand to minimize the risk of injury to the animal, Vet Tech, and other equipment during use. The stand should remain securely attached to the table and should not have sharp edges, exposed mechanisms, or components that could pinch the Vet Tech or animal. The stand should also prevent unexpected movement of the bite block during radiation therapy or CT scans.

The Lever Clamp Design scored a 3 because it relies on one clamp and could shift if the clamp loosens. The Rack and Pinion Design scored a 4 because its two points of contact provide greater stability, but the moving mechanism could create pinch points. The Dual Rack and Pinion Clamp Design scored a 5 because it provides multiple points of contact and distributes forces more evenly, reducing the risk of movement during use.

Cost:

The cost takes into account the total cost to manufacture this product. This includes materials, labor and machinery used. Due to this, cost was given a lower rating of ten because the process of which the design is built is very hands off. All three designs require the use of a 3D printer and do not require physical labor aside from the assembly. Also, the material cost is very low, all three designs would be made of PLA which is an inexpensive material.

The lever clamp design was given the highest score for cost at a 5 because it has lower force carrying members and will not require higher infill during 3D printing and thus will be a lower cost. For the rack and pinion design it was given a 4 due to it having slightly more high force carrying members, this will require higher infill when 3D printing making this design slightly less cost efficient. The dual rack and pinion design was given the lowest score at a 3 because of the three designs it contains the highest amount of high force carrying members, and will require a lot more infill.

Durability:

Durability is defined as the design's ability to maintain its original precision, ease of adjustment, and overall function over time. This means mechanical elements like gears and teeth should be resistant to wear or warping when under the forces of normal use, and the device as a whole should be able to withstand repeated use without cracking or breaking. Durability was given a lower weight because the forces that will be applied to the stands are relatively low and should not cause much wear over time.

The lever clamp stand, rack and pinion stand, and dual rack and pinion clamp all received scores of 4 out of 5 for durability. All 3 designs will be made out of PLA, giving them all the same mechanical properties, and similar chance of wear or fracture. All three designs also feature small elements like teeth or gears, which pose a higher risk of wearing over time. This prevented all designs from receiving a 5 out of 5.