Lesion Localization: A Guided Lab

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Background

Neurophobia is a fear of neuroscience and neurology due to students' inability to apply their basic science knowledge to clinical neurologic situations. It is estimated that half of medical students experience neurophobia at some point in their training,[1] with studies showing that students feel the least knowledgeable in Neurology compared to other specialties, and a sense of nihilism towards the neurologic exam and neurologic diseases.[2] However, as the AAN says, "for most non-neurologists, postgraduate neurologic education is variable and often limited, so every medical school's curriculum must include clinical learning experiences to ensure that all graduating medical students have the basic knowledge and skills required to care for patients with common neurologic symptoms and neurologic emergencies."

This discrepancy between the importance of a strong clinical education in Neurology and students' confidence in learning Neurology is especially concerning in the area of lesion localization. **Lesion localization (LL)** refers to the practice in Neurology of using symptoms and physical exam to identify where a lesion is affecting the nervous system. A **lesion** is any interruption to normal anatomy, including a physical lesion, loss of a specific cell type, etc. Lesion localization is the basis for a large portion of Neurology, but can be plagued by neurophobia because it requires both a solid understanding of neuroanatomy, a grasp on the process of localizing a lesion, and broad knowledge about different symptoms manifestations.

Methodology

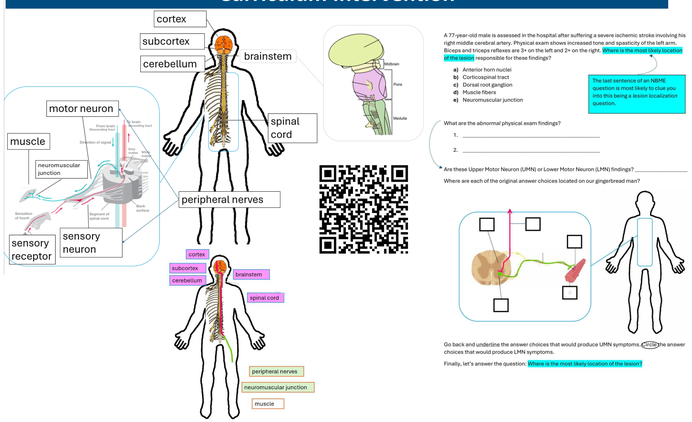
Needs Assessment: Data were collected from the students who took Brain and Behavior in the last two years (Classes of 2026 and 2025) using REDCap about their confidence in lesion localization, resources that were helpful in learning lesion localization, and challenges in learning lesion localization. Analyses were intention-to-treat, and included data from incomplete surveys that were not duplicates.

Curriculum Intervention: Using information learned from the needs assessment, a 1-hour Guided Lab was taught to the Class of 2027 on 1/20/25 during the Brain and Behavior (B&B) pre-clerkship course. It included interactive portions (see associated presentation) and was designed to include NBME-style questions, including a guided note. However, due to time constraints, the questions were not reviewed in-person, but rather, were provided for students to do independently after the lab.

Post-Intervention Brief Assessment: A short, 5-question survey was administered at the end of the Guided Lab. It was opt-in; data was not collected from all attendees.

Post-B&B Full Assessment: A REDCap survey using the same questions as the Needs Assessment was used to collect data from the Class of 2027 after completing the B&B course. It was only open to students who had attended the Lesion Localization Guided Lab. It was opt-in; data was not collected from all Guided Lab attendees.

Curriculum Intervention



Results

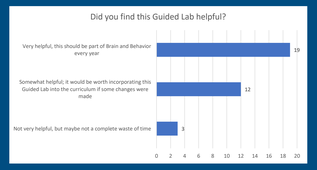
Table 1. Needs Assessment Participant Characteristics

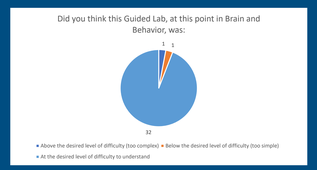
	n (%)
Total participants	75 (100.)
Class of 2025	28 (37.3)
Class of 2026	47 (62.7)
First taught LL as general concept	45 (60.0)
First taught LL for a specific disease	14 (18.7)
Does not remember	16 (21.3)

Table 2a. Top 5 B&B Final Exam Resources Used – CO2025, 2026 (N=75)	n (%)
UWorld Questions	55 (73.3)
First Aid for STEP 1	54 (72.0)
Boards and Beyond	45 (60.0)
AMBOSS Questions	41 (54.7)
Brain and Behavior Lectures	39 (52.0)

Table 2b. Top 5 Step 1 Resources Used – CO2025, 2026 (N=75)	n (%)
UWorld Questions	59 (78.7)
First Aid for STEP 1	53 (70.7)
Boards and Beyond	37 (49.3)
AMBOSS Questions	29 (38.7)
Pathoma	25 (33.3)

Post-Intervention Brief Assessment (N=34)





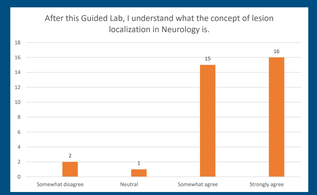


Figure 1a. Students' Confidence in Lesion Localization *without* the Guided Lab

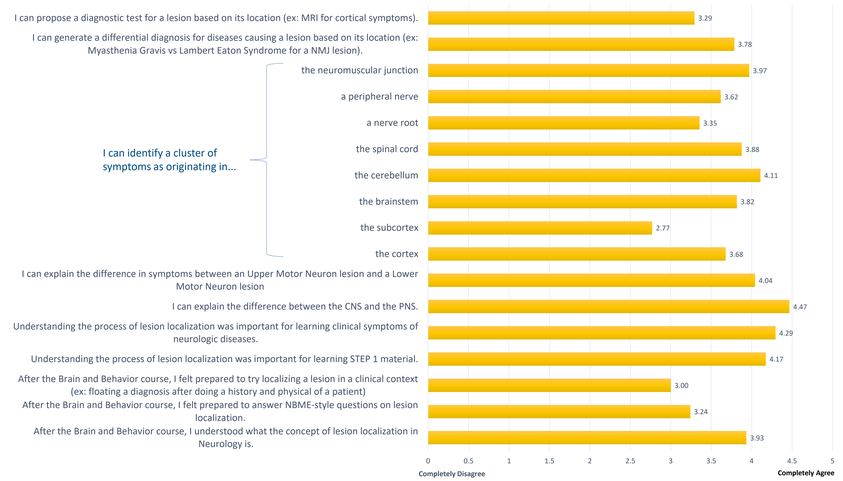


Figure 1b. Students' Confidence in Lesion Localization *with* the Guided Lab

	B&B Final Exam Score
Class of 2025 + 2026 (n=50)	80%
Class of 2025 (n=16)	84%
Class of 2026 (n=34)	78%
Class of 2027	

Discussion

This curriculum design project used an interactive Guided Lab to introduce to general concept of Lesion Localization to pre-clerkship students. The majority of students found the Guided Lab helpful and at their desired level of difficulty. Students liked that the Lab was **stepwise** and **interactive**.

Compared to students who took B&B without the Guided Lab, students who participated in the Guided Lab

Selected Quotes

The Guided Lab "helped incorporate and synthesize concepts from separate lectures into one exercise. Also, tying symptoms to lessons really helped solidify where activities are localized in the nervous system."

"Needs to be longer or into two [sessions] to cover and maybe do questions between each [section]."

Limitations and Future Directions

The most common feedback on the Guided Lab requested:

- More time to discuss more confusing tracts and to practice NMBE-style questions
- To include real-time explanations of each step, rather than recorded explanations
  - Or to improve explanation and audio quality
- An online drag-and-drop version of the poster in addition to the physical components

References and Funding

References

1. Jozefowicz RF. Neurophobia: the fear of neurology among medical students. *Arch Neurol*. 1994;51(4):328-329. doi:10.1001/archneur.1994.00540160018003
2. Shelley BP, Chacko TV, Nair BR. Preventing "Neurophobia": Remodeling Neurology Education for 21st-Century Medical Students through Effective Pedagogical Strategies for "Neurophilia". *Ann Indian Acad Neurol*. 2018;21(1):9-18. doi:10.4103/aian.AIAN_371_17
3. Safdieh JE, Govindarajan R, Gelb DJ, Odia Y, Soni M. Core curriculum guidelines for a required clinical neurology experience [published correction appears in Neurology. 2019 Jul 16;93(3):135. doi: 10.1212/WNL.0000000000007481]. *Neurology*. 2019;92(13):619-626. doi:10.1212/WNL.0000000000007187

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