BUILDING INTERACTIVE PHYSICS SIMULATIONS WITHOUT WRITING CODE: THE PROMISE AND THE PERILS OF AI-ASSISTED "VIBE CODING"

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Interactive simulations are among the most effective tools for teaching physics, yet building them has traditionally required programming skill that most physics educators do not possess. This contribution reports a practical experience of creating sophisticated, browser-based interactive physics simulations entirely through natural-language interaction with AI agents – an approach often called "vibe coding" – without the author writing any code. The work presents both the opportunity this represents for engineering and physics education and the risks that arise when AI-generated output is not rigorously supervised.

The bright side: working with conversational AI tools (ChatGPT, Gemini) and an AI application-development agent (Lovable), the author produced two publicly accessible educational simulations in the field of medical physics: an interactive computed-tomography imaging sandbox and an eleven-lesson radiotherapy treatment-planning course. Features that an educator might assume to be beyond reach were implemented with minimal effort: a functional Dose-Volume Histogram, real-time Filtered Back Projection reconstruction, and algorithmic optimization that the AI agent diagnosed and implemented, reducing a dose calculation from twenty seconds to one. The development effort was a small fraction of what conventional software development would require, placing semi-professional-grade interactive tools within reach of any educator.

The dark side: the same fluency that makes AI assistance powerful can mask substantive errors. AI-generated anatomical models contained mistakes that no expert eye was needed to catch – a heart placed on the wrong side of the chest, lungs intersecting the rib cage, and an S-shaped scoliotic spine produced in response to a request for normal curvature. None of these errors would be detected by the AI itself, and in less obvious setup a non-supervising user would publish them unknowingly. The central message for educators is that "vibe coding" does not remove the expert from the loop; it relocates the expert's role from programmer to pedagogical director and content validator – a role that becomes more, not less, important.

The presentation will demonstrate the simulations live, recount the development process candidly including its failures, and offer concrete guidance for engineering-physics educators who wish to build their own interactive tools while avoiding the pitfalls of unsupervised AI-generated content. The relevance for physics teaching in engineering education is direct: AI-assisted development lowers the barrier to creating active-learning resources, but only disciplined, expert supervision turns that capability into trustworthy teaching material.

[1] J. M. Fagerstrom, W. Gao, G. E. Robertson (2019). A hands-on introduction to medical physics and radiation therapy for middle school students. Journal of Applied Clinical Medical Physics, 20(4), 148–153.
[2] V. J. Montemayor, E. L. Bossart, J. W. Burmeister, et al. (2025). AAPM WGTEACH Report 366: Best practices in the teaching and mentoring of medical physics. Journal of Applied Clinical Medical Physics, 26, e70259.