

AI-Generated Video in the Engineering Classroom: Will AI bridge the gap between static textbook figures and students' dynamic mental models?

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AI-generated content, especially pictures and videos, is inevitably becoming part of our lives, e.g., social media, marketing, and entertainment. In education, we may be able to adopt this technology to generate personalized material suitable for individual students or specific classes. Dr. Thanakorn Khamvilai, an Assistant Professor in the Department of Mechanical and Aerospace Engineering at Texas Tech University, tries to bring static textbook figures to life and study how they can improve students' learning. This is a similar concept that we have seen in Harry Potter movies. As an engineering professor with no skills in computer graphics, he could use these AI tools to explore this idea.

Dr. Khamvilai was teaching Engineering Mechanics: **Dynamics** in the Fall 2025 semester. As the course title implies, this class involves a study of a moving object(s). However, textbook figures do not move; therefore, this class is ideal for Dr. Khamvilai to answer his research question: "*Will AI bridge the gap between static textbook figures and students' dynamic mental models?*" He began his study by asking AI to generate a video that animates the motion of several classical textbook problems for the Engineering Dynamics class, including a simple pulley motion (under the topic of absolute motion analysis), depicted below. He guided the AI using different rough and detailed prompts. For example, by just throwing in an image, including the original problem description for the textbook, telling it to animate only ropes and pulleys, not the floor, providing physics law (i.e., Newton's 2nd law), providing a hand-written solution to the problem, and providing Python and MATLAB codes that

explicitly solve the problem and the animation motion. However, the current AI technology does not seem to be well-grounded in real-world physics.

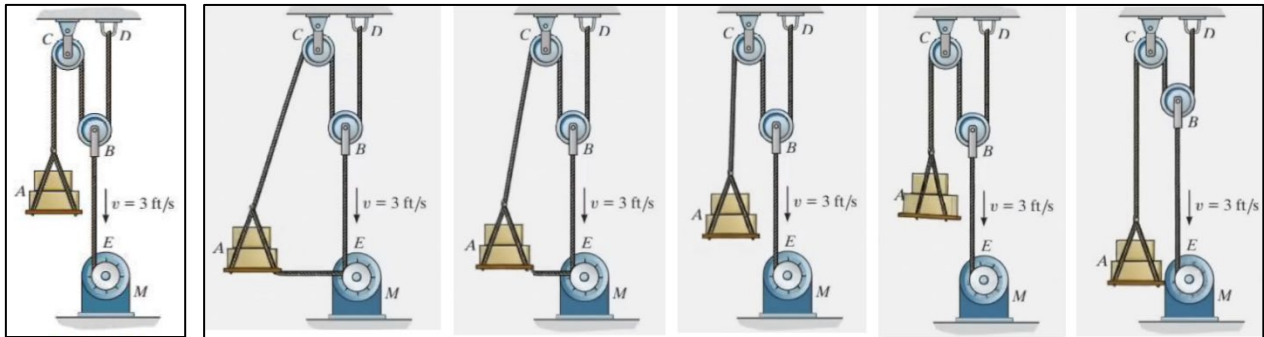
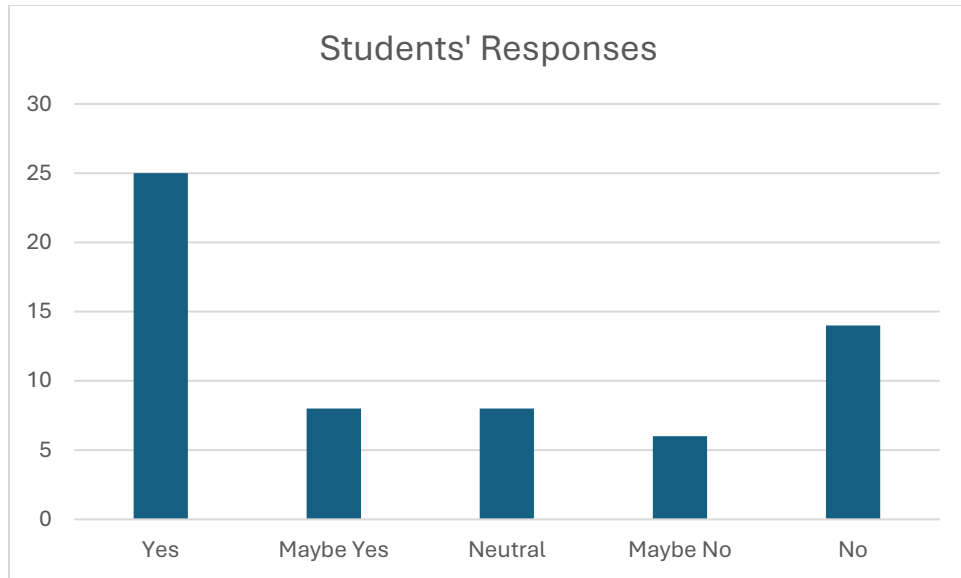


Figure 1: (Left) The original figure from a textbook problem. (Right) A sequence of AI-generated video animation.

As you can see from the figure above. An AI failed to follow the physics law. Specifically, an imaginary rope between the load (A) and the motor (M) appeared and later disappeared. The load (A) was lifted up, but the pulley (B) stays still. The load (A) was spinning without an applied torque. The load (A) and the pulley (B) move in the opposite direction to what the question is doing (denoted by the velocity of the BE rope). In addition, the relative motion (velocity) in the video between the load (A) and the pulley (B) does not follow the analysis from Newton's law. This is clearly an issue with how AIs are trained, as well as their fundamental mathematical architecture and algorithms behind the scenes. Although there is a possibility that this issue will be solved in future generations of AI, Dr. Khamvilai also wants to explore his students' perceptions of AI usage.

He further conducts a survey to gather opinions of his students. In his Engineering Dynamics class in the Fall 2025 semester, there were 72 students enrolled, 61 of whom responded to his survey. The survey contains one question, which is “Current AI can generate videos, but the motion is not physically accurate. Would it be helpful for your understanding of the class materials if there is an AI that can accurately animate the motion of textbook problems? Why or why not?”, with the video of the animation above attached. The answers are categorized into 5 categories: Yes, Maybe Yes, Neutral, Maybe No, and No. The responses for each category are 25, 8, 8, 6, and 14, respectively, as shown in the plot below. This translates to roughly 41%, 13%, 13%, 10%, and 23% for each category.



The students also had an option to explain their answer. Some actual answers from students in each categories are included in the table below

Category	Students' Comments
Yes	Yes, this would be extremely helpful because there are several problems that take me several minutes to understand the motion that is being described. When I can't understand the motion, I struggle to figure out how to come up with a solution to the problem.
	Yes. For problems like this, an accurate animation would be very helpful. When studying, I often have to mentally picture how each string or component moves to determine the number of moving parts and relate velocities, so having a visual would make that process much quicker and clearer. Applied across other kinematics and particle-motion problems, it would strengthen understanding and reduce confusion.
	I like this idea of using AI, of course with accurate motion. Some problems like the 3rd problems on midterm 2 with the plane, spring, and string would be a lot easier to rap my head around if I could see it in action like this. As well as the problem with the vertical pillar and the collar attached to the spring around it, seeing that problem in motion would be a game changer.
Maybe Yes	I think it would be helpful because sometimes it can be hard to understand what is supposed to be happening. However, I do not think it is necessary because we should be able to figure it out based off what is given.
	slightly, but in most cases, it's pretty easy to envision it or just draw the direction starting from the initial force applied and following its path backwards.

	I actually really enjoy this! A video like this would've been really useful in visualizing the process of a problem if I hadn't gone through statics yet. This for the complex rope problems from the first test would have been useful to set up my equations. However, I would not like these videos if they caused classes to run significantly slower, like if applied to simple problems. Using these sparingly may be the best for student understanding.
Neutral	i would have to attempt a couple problems myself to see if it would help me personally, but so far i have not had an issue with visualizing moving objects in a problem. definitely something to look into though!
	I don't have much of an opinion of AI at the moment, but it's like any other tool. If it's sufficient to demonstrate a concept or problem, there's no reason not to try it out. Visuals don't need to be extremely realistic necessarily; it's the end goal of learning that matters.
	I think it would help a little, but you thoroughly explain them regardless.
Maybe No	I mean I think it can only help, but also, I think it would not be a good idea to completely rely on this as of right now there is sure to be issues.
	If the ai is review to be accurate then yes. As long as the video is correct and doesn't misinterpret the problem then it would be very helpful. However, if done incorrectly it could do more damage than good by teaching us and reinforcing information that is false.
	Maybe in some instances, but for the most part it wouldn't bother me if we did or didn't do this.
No	for me not really, because I have a good idea most of the time how things move and work.
	I do not believe AI is necessary. I think that drawing out several different places of the problem. For example, in the diagram above drawing it with the box at the initial position then where it might be at $t=2$ and $t=$ final. it might help understand that the pulley moves twice as far as the pulley attached to the motor.
	Not really. FBD help enough

According to the survey's quantitative results, a greater number of students believe that AI-generated videos can be helpful. However, when looking at the qualitative results, there are both groups of students who struggle with mental models and those who do not have issues at all. As an instructor, if you decide to use AI in classrooms, it is important to manage the in-class activities and activities that can be discussed later during office hours to maximize the learning outcomes for every student.