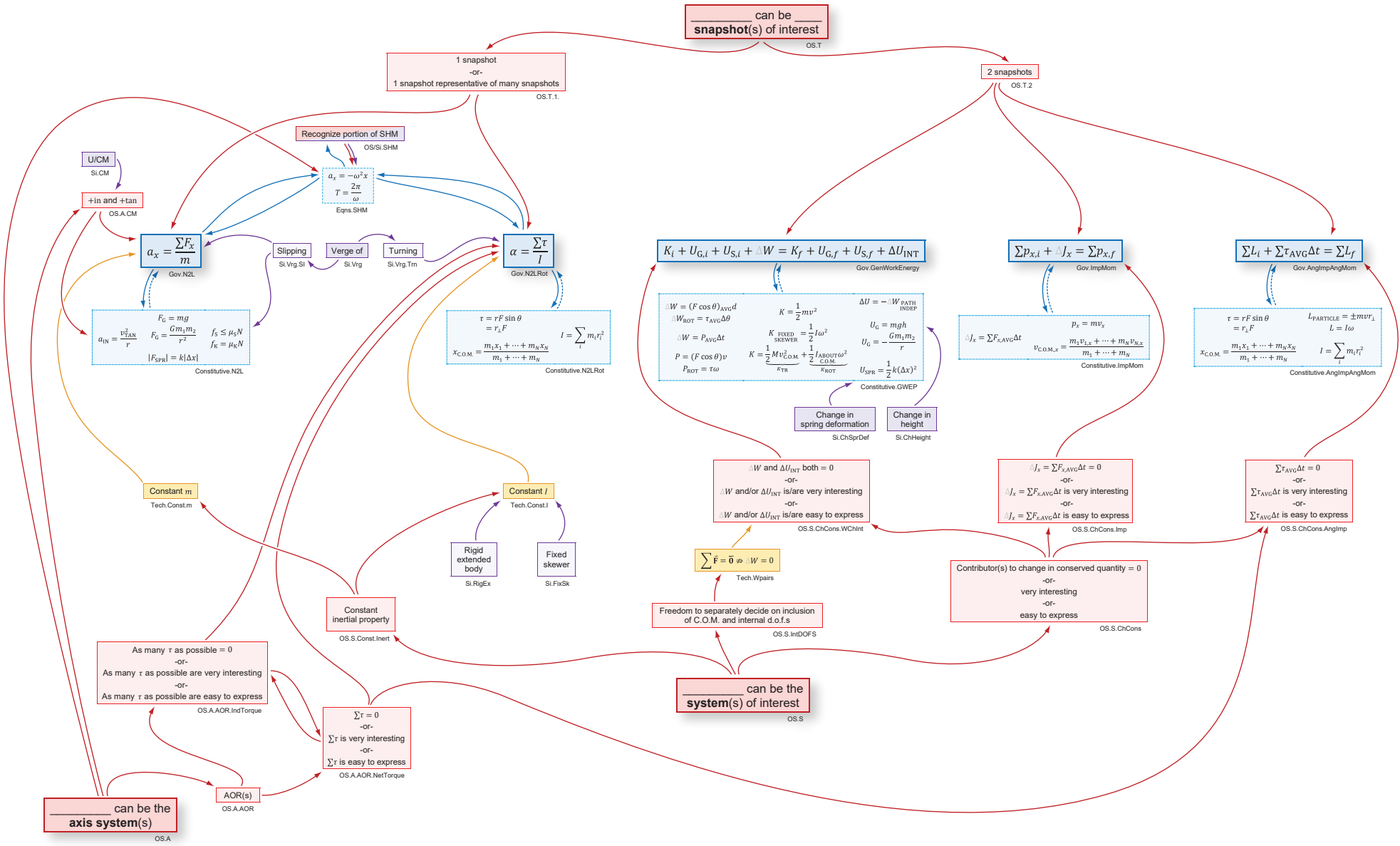
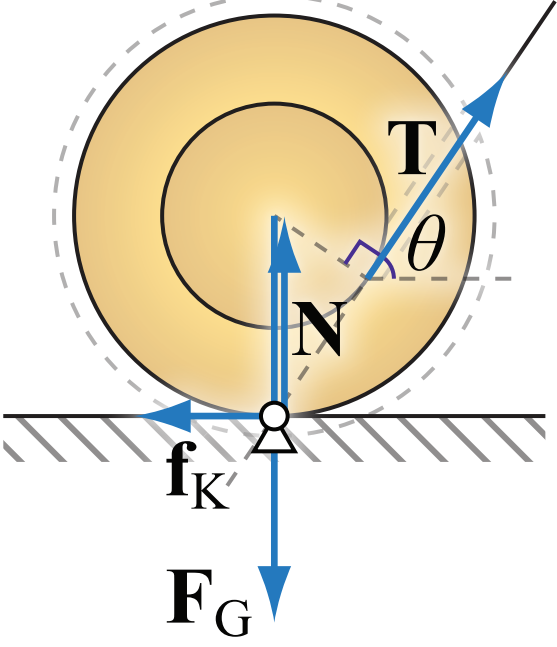
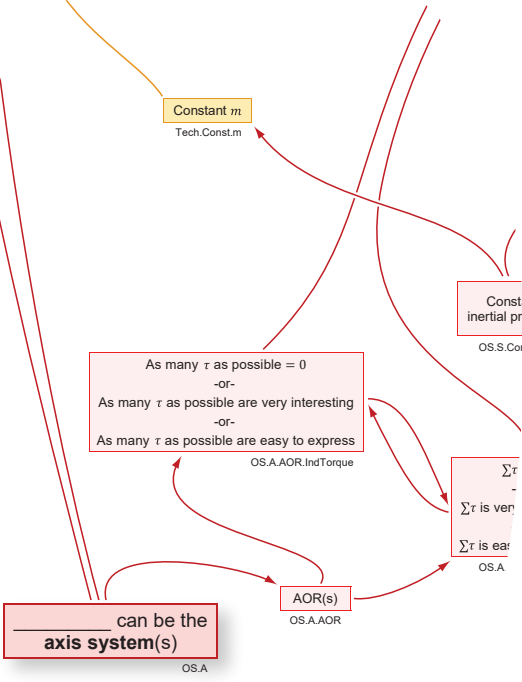


Sketch production rules before designing, categorizing, solving, and grading problems



Example problem	Example of relevant portion of production system	Examples of possible questions	Examples of possible answers
<p>Classic problem: "... At what angle should the thread be pulled so that the spool does not spin?"</p> 		<p>Student: "How did you know to use ...?"</p> <p>Me: "Is this problem difficult in a way that is helpful for tomorrow's lesson?"</p> <p>Me: "How can I make a problem with a layer of non-obvious ontological shifting?"</p> <p>Parent: "How is my child doing?"</p>	<p>Me: "The production system suggests seeking an AOR that allows for as many torques of interest to equal zero (OS.A.AOR.IndTorque)."</p> <p>Me: "Recognizing the line segment of contact between the spool and floor as defining an AOR can be difficult because students are accustomed to identifying AORs that are collinear with the common axis of concentric circles, illustrated hinges, illustrated pivots, and illustrated axles. My student is interested in competing in the AAPT USAPhO, so practicing this kind of ontological shifting would be helpful for them."</p> <p>Me: "The production system reminds me that we can make use of freedom in choosing our AOR. We can make the choice of a helpful AOR more difficult by setting up a problem where the AOR does not coincide with the axis of concentric circles and does not coincide with illustrated hinges, pivots, and axles."</p> <p>Me: "Student S is on target for ..."</p>

Useful links

Chi, M.T.H., Feltovich, P.J. and Glaser, R., "Categorization and Representation of Physics Problems by Experts and Novices." *Cogn. Sci.*, **5**: 121-152 (1981). doi:10.1207/s15516709cog0502_2

O'Shea, K. "Standards-Based Grading", *Physics! Blog!* <https://kellyoshea.blog/standards-based-grading/>

