Heat & Temperature of Water Vapor

A pressure cooker is an enclosed pot that expels air and traps water vapor, which increases the internal pressure. This in turn raises the boiling point of water and allows food to cook at high temperatures.

Imagine you have a large industrial pressure cooker that holds 1 kg of water vapor. You would like to know how responsive the system is to changes in temperature. To do this, you need to determine a characteristic *rate*: how much heat is needed to change the temperature by a small amount.

The graph shows internal energy and volume contours plotted on temperature and pressure axes.

Internal Energy	2cm	→	170. kJ
Temperature	2cm	→	70 K
Pressure	2cm	→	128000 Pa
Entropy Contours	Curves	→	0.33 kJ/K apart
Volume Contours	Line Segments	→	0.7 m^3 apart

Estimate: Use the graph to determine this temperature-responsiveness when the volume is held fixed. The initial state of the system corresponds to the black square. Describe your process.

Explain: Why does it matter that you are holding volume constant in the above estimate?

Explore: Does the value of your estimate depend on the value of the volume?