

**Natthi Sharma**, Professor, Physics and Astronomy, uses his stories from growing up in India to help students understand scientific principles and another culture at the same time.

Though my subject is beyond national boundaries---in fact it is universal in its scope---I still present stories from my rural Indian background to illustrate some ideas in my teaching material. A few examples are presented below.

1. When I teach Archimedes' principle about reduction in the weight of an object submerged in a liquid being equal to the weight of the displaced liquid, I tell my students the following story:

I grew up in an interior village in India. We had to draw drinking water from a well. Being playful as children are, I used to let the metallic water-filled bucket sink further from the water surface in the well and then pull it up. The pulling seemed almost effortless as long as the bucket was still inside the water. But when the filled bucket comes out of water, suddenly you have to pull harder. When I came across Archimedes' principle in college, I could immediately correlate it to my childhood experience of it.



And, based on that experience I designed a new demo to my classes here at Eastern to show that water has no weight inside water. I take a balloon, fill it water by stretching its opening over a water faucet (remove any left over air) and tie a knot and attach a string to weigh it using a spring balance. Then I submerge it in a beaker filled with water and weigh it again. It weighs nothing! I repeat the

demo with an iron weight and the scale shows less weight in water.

2. When I teach thermal expansion --- most things expand on heating and shrink on cooling --- I ask my class what about a hole in an iron plate? Will it expand or shrink? Then I tell the story from my rural experience about the smartness of the common blacksmith. To reduce the tear and wear of bullock-cart



wooden wheels the blacksmith makes an iron hoop whose radius is less than the wheel radius. He heats it enough to mount it around the wheel. When it cools down it grabs the perimeter of the wheel.

3. When I teach astronomy I tell them how villagers used to find the time at night using planets and constellations of stars. There were no watches or alarm clocks back then. They used to take their buffalos for grazing between 3-4 am so they could get more milk in the morning afterwards. They also knew that when shadows are smallest it is the local noon-time.
4. I also tell them about exams and their format in India. There used to be only one cumulative exam at the end of ten months. There were more analytical derivations and fewer application oriented numerical problems in the final exam. I discuss pro and cons of two approaches between this style and the academic assessment style at EMU and at many other institutions in the U.S.