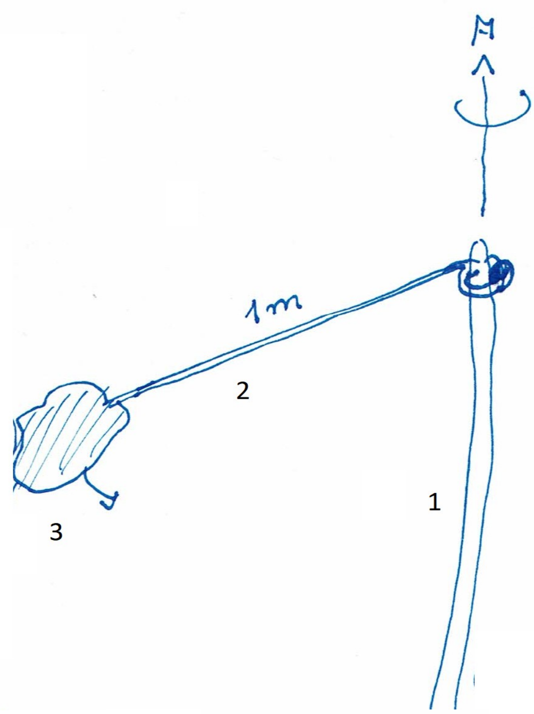
Conservation of Angular Momentum

1 plug in, pole
2 string (about 1 m long)
3 weight
A rotation axis



Teacher's Guide:
Tie the weight to an approx. 1 m long line and to a stick, stake, pole or pole. You can also hold the string with your fingers.
Set the weight in rotation so that the cord winds around the bar or arm.
Task:
Watch the speed of weight!
Result:
The shorter the cord, the smaller the turning radius, the faster the weight revolves!
Not only the rotation frequency ω becomes larger, but also the velocity v.
Statement:
For a mass m which rotates about an axis A and on which only radial forces act, angular momentum conservation, i. that at any time the product of mass, radius and speed is the same:

$$m \cdot v(r) \cdot r = const.$$

or for any two positions (1) and (2):

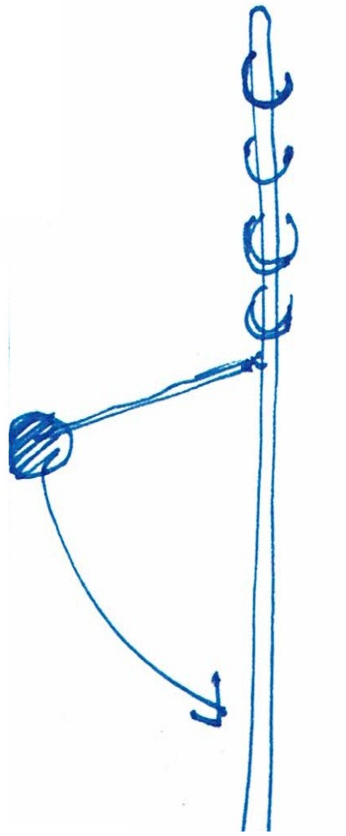
$$m\, v_1\, r_1 = m\, v_2\, r_2$$

With

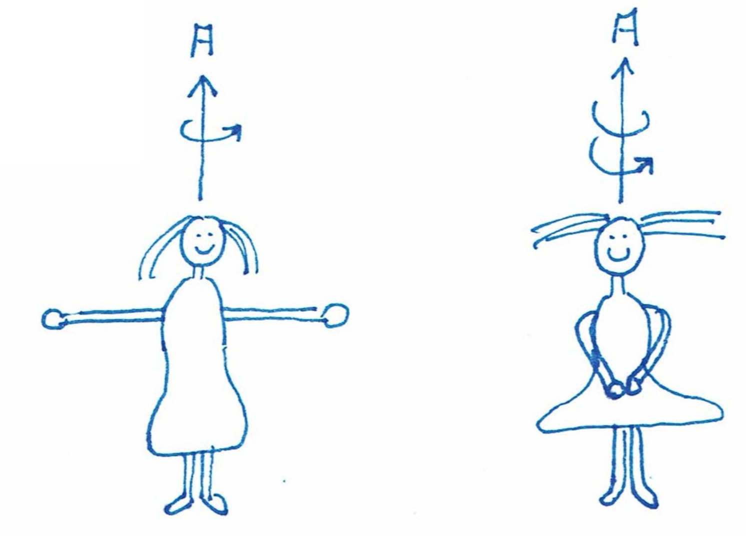
$$v = \omega r$$

$$m\, \omega_1\, r_1^2 = m\, \omega_2\, r_2^2$$

$$\frac{\omega_1}{\omega_2} = \left(\frac{r_2}{r_1}\right)^2$$



In other words, if the radius is halved, the rotation frequency quadruples!
Teachers question:
A ballet dancer turns a pirouette. How can she speed up her rotation?
Answer:
By putting on the outstretched arms!



Category	
Title	Conservation of angular momentum
Physical subject matter	Mechanics, rotation
Learning level	4
Preparation difficulty	2
Price per set/€	
Attractiveness	2
Standart-exotic	2
Instructions set-up	yes
Instructions execution	yes