Contribution ID: **31** Type: **Oral Presentation**

INTERACTIVE ENGAGEMENT AND SEMIOTIC RESOURCES IN A CLASSICAL MECHANICS LESSON SETUP

Friday, 5 October 2018 08:30 (20 minutes)

In this paper we present an investigation of what meaning first-year university physics students make of force and motion when discussing elevation, velocity and acceleration during trampoline bouncing. A mathematical analysis of trampoline bouncing is provided in [1,2]. We aim to develop a better understanding of how students can overcome difficulties in understanding those central concepts of classical mechanics.

As a starting point, we used an assignment based on Rosannagh MacLennan's gold medal trampoline routine. She used 19 seconds (as extracted from the video [3]) to complete the routine of 10 jumps. The score board shows that 16 of these seconds were 'flight time'. Several groups of students were video-recorded as they worked to discern the different types of motion involved. They were asked to draw approximate graphs of elevation, velocity and acceleration during two full jumps of the routine with the approximation that all jumps are similar.

Previously [4], we found that students rarely made use of earlier kinaesthetic experiences of trampoline bouncing. To encourage that connection, another cohort of first-year university physics students were asked to work in small groups to create short movies of themselves bouncing and also explaining the forces involved during the motion, as well as draw graphs of elevation, velocity and acceleration during the jumps. They were also invited to use their smartphones for data collection [5,6].

The video-recordings were analysed using a naturalistic methodology with respect to the use of various semiotic resources and how the students interact with each other in discussing the assignment. Also we looked for students´ understanding and conceptions concerning disciplinary knowledge, kinaesthetic experience and (pre-/alternative-) conceptions. In addition, we analysed how the students explain force and motion, when asked to create a short movie of themselves bouncing.

An analysis of these discussions will be presented and implications for teaching classical mechanics will be discussed.

1. A.-M. Pendrill and D. Eager, Free fall and harmonic oscillations - analysing trampoline jumps Physics Education 50, 64-70 (2015)
2. D. Eager, A.-M.Pendrill and N. Reistad, Beyond velocity and acceleration: jerk, snap and higher derivatives Eur. J. Phys. 37 065008 (2016)
3. London 2012 Olympics: Rosannagh MacLennan Wins Women's Trampoline Gold, https://youtu.be/vm3HAM1czb0?t=1125
4. A.-M. Pendrill and L. Ouattara, Force, acceleration and velocity during trampoline jumps—a challenging assignmentPhysics Education 52, 6, 065021 (2017)
5. C. Vieyra, Physics toolbox sensor suite http://vieyrasoftware.net/
6. PhyPhox – Physical Phone Experiments, phyphox.org

Primary author: Dr OUATTARA, Lassana (National Resource Center for Physics Education)

Co-authors: Prof. PENDRILL, Ann-Marie (National resource centre for physics education, Lund university); Mr SVENSSON, Kim (National resource centre for physics education, Lund university); Ms ERIKSSON, Moa (National

resource centre for physics education, Lund university); Dr ERIKSSON, Urban (National resource centre for physics education, Lund university)

Presenter: Dr OUATTARA, Lassana (National Resource Center for Physics Education)

Session Classification: Parallel Session 1

Track Classification: Track A - Physics at University