

M.Sc. / Ph.D. student position will be available, starting in the Fall 2020 / Winter 2021 in the group of Professor Calvin Kalman at the Department of Physics, Concordia University, Montreal, Canada.



In traditional lecture courses as well as courses that use interactive engagement, students are *less* expert-like at the end of the course than they were at the beginning (Madsen, McKagan, & Sayre, 2015). Our recent research was based on the hypothesis that students' epistemological beliefs could become more expert-like with a combination of appropriate instructional activities: (a) pre-class reading with metacognitive reflection (Kalman, 2011), and (b) in-class active learning that produces *cognitive dissonance* (Kalman et al. 2015).

Changing how students learn

2 possible positions; 1) if funded by SSHRC-Understanding the dynamics and functionality of student group interactions is vital for the effectiveness of the learning environment. We will show how student groups interact both quantitatively and qualitatively under different conditions and environments, group sizes or changing participants over time. Our objective is to determine how to select groups of peers in order to optimize their collaboration.

2) if funded by Spencer- This study aims to provide a reliable process for science teachers to tackle demanding conceptual parts of material. Some students' world view is knowledge-in-pieces (KiP) as described by diSessa, Gillespie, & Esterly (2004). On the other hand, Lattery (2016) shows that other students have a coherent theory but it is often not scientifically supportable. Specifically, these ideas are *incommensurable* to accepted scientific theories (Chi, 2013). Each view has important and different implications for the goals and methods of instruction that lead to productive changes in the student's knowledge structure (conceptual change).

Concordia's Department of Physics is a growing department in a university with rapidly increasing rating. We offer research-based M.Sc. and Ph.D. programs. Our faculty members conduct research in the areas of Condensed Matter Physics (theoretical and experimental), Molecular Biophysics, Medical Physics / Imaging, Photonics, Theoretical High Energy Physics, Computational Physics and Physics Education.

Successful applicants will be offered financial packages consisting of RA, TA and various awards of at least 20,000 CAD per year (often more), for 4 years (Ph.D.) or 2 years (M.Sc.). International students will be offered tuition remissions or other awards to compensate for the international tuition fees.

Please contact Professor Calvin Kalman (Calvin.Kalman@concordia.ca) or Professor Valter Zazubovits, Graduate Program Director (valter.zazubovits@concordia.ca) for more information.