**Nov. 4th IAAPT Schedule**

(We will try to adhere to this schedule, but will adjust as needed)

**8:00 - 9:00 AM** – Registration, Lobby area

**9:00 - 9:15 AM** – Welcoming, Opening Remarks,  Ethan Brue, Professor of Engineering and Division Chair for the Mathematics and Physical Sciences division will be welcoming us on behalf of Dordt College.

**9:15 – 9:30 AM** – Additional members welcome with mention of a few logistical items from John Zwart and “Notes From the Iowa Chapter AAPT Section Representative” by Nate Quarderer.

**9:30 – 10:30 AM** - Keynote address: “Grand Challenges in Science Education” - John Bedward, Buena Vista University, Storm Lake, IA.

The convergence of the Next Generation Science Standards (NGSS), active learning, the Internet, big data and mobile devices provide us with an opportunity to rethink the K-16 learning experience. This talk will center on mobile sensors, global science and engineering collaborative platforms and citizen science as vehicles to foster authentic learning. Bring your smart device and get ready to play.

**10:30 – 10:45 AM** – Break and Refreshments.

**10:45 AM – 11:45 AM** – Invited Speakers (10 minutes each with 5 minutes for questions, while we start setting up for the next speaker)

**10:45 – 11:00AM** “Developing Student Understanding: A Course in Philosophy and Theology of Science.” -- John Zwart and Carl Fictorie, Dordt College, Sioux Center, IA.

Even within a fairly homogenous religious community there can be significant differences in understanding how religion and science are related. Discussions on topics such as climate change or age of the universe can be polarizing. At Dordt College we use a course, “Perspectives in Physical Science,” required of physics and chemistry majors and serving others as a core course, to increase our students’ knowledge and understanding of issues relating science and religion while respecting their prior understanding and convictions. Topics explored in the course range from fundamental issues regarding the nature of science, to surveying the various philosophical and theological traditions which are used to frame scientific inquiry, to discussing how science can be a genuine calling for Christians. This course, including its goals, major topics, and methods of instruction will be discussed.

**11:00 – 11:15 AM** “The NOYCE program and our current efforts to increase teacher supply.” -- Jeffrey T. Ploegstra, MS, MAT, PHD. Associate Professor of Biology and Environmental Studies, Dordt College, Sioux Center, IA.

According to the TIMSS (Third International Math and Science Study), US students scored the lowest on Physics of 15 nations included (1). Teaching quality is impacted by many factors including curriculum, student demographics, school resources, teacher preparation, teaching loads, and teacher turnover. Curriculum is the most tractable of these components and the NGSS (next generation science standards) are a clear attempt to support high quality teaching. The supply of highly qualified teachers, however, continues to be a major issue. Currently only about 47% of highschool physics classes are taught by a teacher with a degree in physics (2) while the number of students taking physics in highschool has more than doubled in the last 30 years (3). Additionally, this growth has been disproportionately high among students taking honors, 2nd year or AP physics courses (3). The NOYCE program was established in order to increase the pipeline of new highly qualified teachers. This program supports scholarships for promising science engineering and math majors to participate in teacher preparation programs (4). It also supports the development of new pathways to certification for aspiring high school science teachers. This presentation will address the structure of current efforts to improve student access to highly qualified teachers and stimulate discussion about additional strategies for increasing supply, supporting teacher development, and improving retention.

1. (a) Ina V. S. Mullis, Michael O. Martin, Albert E. Beaton, Eugenio J. Gonzalez, Dana L. Kelly, and Teresa A. Smith, Mathematics and Science Achievement in the Final Year of Secondary School: IEA's Third International Mathematics and Science Study (TIMSS) [IEA = International Association for the Evaluation of Educational Achievement] (Center for the Study of Testing, Evaluation, and Educational Policy, Boston College, Chestnut Hill, MA, 1998). Available at: http://timss.bc.edu/timss1995i/HiLightC.html. (b) TIMSS International Study Center, TIMSS Physics Achievement Comparison Study: IEA's Third International Mathematics and Science Study (TIMSS International Study Center, Boston College, Chestnut Hill, MA, 2000). Available at: http://modeling.asu.edu/Evaluations/TIMSS\_NSFphysicsStudy99.pdf.

2. Jason G. Hill and Kerry J. Gruber, Education and Certification Qualifications of Departmentalized Public High School-Level Teachers of Core Subjects: Evidence from the 2007-08 Schools and Staffing Survey, Statistical Analysis Report [NCES 2011-317] (National Center For Education Statistics, U.S. Department of Education, Washington, D.C., 2011). Available at: http://nces.ed.gov/pubs2011/2011317.pdf.

3. Susan White and Casey Langer Tesfaye, High School Physics Courses & Enrollments: Results from the 2012-13 Nationwide Survey of High School Physics Teachers (American Institute of Physics, College Park, MD, 2014). Available at: http://www.aip.org/statistics/reports/high-school-physics-courses-enrollments-0.

4. Robert Noyce Teacher Scholarship Program. Program Solicitation NSF 17-541. Available at: https://www.nsf.gov/pubs/2017/nsf17541/nsf17541.pdf

**11:15 – 11:30 AM** “Collecting Student Responses: Plickers in the physics classroom” -- Kayt Frisch, PhD. Associate Professor of Engineering & Physics, Physics Department Chair, Dordt College, Sioux Center, IA.

In keeping with current best-practices pedagogy, many physics teachers use clickers, mini-white boards or letter cards to collect student responses to questions during a class. This semester I have been experimenting with a new(er) technology for doing this – Plickers. Plickers are a free mash-up of clickers and letter cards, that uses the teacher’s smart phone (or similar) and student QR codes to collect student responses. In this talk I will give a brief introduction to Plickers, demonstrate how to use them, and discuss how I am using them in an algebra base intro classroom.

**11:30 - 11:55 AM** "Graphical Solutions to Introductory Physics Problems." – Matt Harding, West High School, Iowa City, IA.

On whole Kelly O'Shea graphic solutions to problems that we do in modeling drawing force addition vector diagrams and solving kinematics (and other) problems with graphs.

**12:00 – 1:00** – Lunch/Door Prizes

**1:00 – 1:15 PM** “The experimental curriculum and pedagogy helped to improve students’ AP Physics 1 Exam scores.” -- Ian Spangenberg, Physics Teacher, Pleasant Valley High School, Bettendorf, IA.

Every year, hundreds of thousands of high school students take the AP Physics 1 Exam. Passing scores can mean college credit, recognition, and scholarships. While typical physics courses teach the content and solution procedures in discrete units such as dynamics, energy, and momentum, the AP Physics 1 Exam requires students to solve problems without problem-type headings or unit captions. Students must also be able to support ideas and answers using overarching theories, laws, and principles. This research looks at a curricular and pedagogical strategy designed to teach AP Physics 1 students how those discrete units fit together into a complete story of physics. Instruction also included lessons regarding when to use laws and principles from a specific unit and why those ideas apply to certain contexts. Part of the instructional strategy included a formative assessment series which both measured student growth and gave students practice using the cognitive tools associated with the experimental curriculum and pedagogy. Students showed an average of 20% growth in problem solving and answer success over the course of the formative assessment series. The class average of AP Physics 1 Exam scores also increased by about 20% when compared to a previous academic year, which did not include the experimental curriculum and pedagogy. The experimental curriculum and pedagogy helped to improve students’ AP Physics 1 Exam scores.

**1:15 – 1:30 PM “Position and Velocity vs. Time Curves with Arduino”** -- Nathan Quarderer, Northeast Iowa Community College, Calmar, IA.

In response to recent pushes for integration of STEM (technology, engineering, and mathematics) into the science curriculum, coupled with growing momentum behind the ‘maker’ movement, I have been inspired to re-think the way I approach activities in my introductory physics classroom. The widely-available Arduino microcontroller provides an inexpensive means of infusing traditional physics lessons with a hint of STEM, giving students the opportunity to build their own data acquisition devices. I will demonstrate one example of how I’m using these ideas with my classes, during a unit on one-dimensional motion. Students build and program a motion detector, and then use it to obtain information about how their position, and velocities change with time. These data are exported from Arduino, and represented graphically using Excel. While this may take longer than traditional techniques reliant on the use of commercially available equipment, the time spent data wrangling has proven to be beneficial.

**1:30 – 2:00 PM** IAAPT Business meeting and election of a new President Elect and Vice President (High Schools).

**2:00 - 3:00 PM** - State-Of-The-Art Motion Biomechanics Lab Tour. Lab director, Prof. Kayt Frisch, will lead a tour of the lab facilities which is a state-of-the-art motion biomechanics lab on campus. The lab has an array of high speed cameras, a force plate, and an EMG system for recording motion, ground reaction force (“normal force”) and muscle electrical activity respectively. Prof. Kayt Frisch will talk about some of class projects and biomechanics research being conducted in the lab.

**3:00 PM** – Break/Go Home!