Oak Park and River Forest High School
Division of Science and Technology
Models Core Science Sequence

An alternative to our traditional Biology, Chemistry, Physics is the Models sequence. The Models of Physics course is the first in a three year sequence of core Science courses. A more detailed explanation of the Models of Physics course and Models of Science sequence follows.

Rationale for Offering a Physics First Core Science Sequence

Mastery of current Biology content that makes its way into our high school and college classrooms requires that students have a solid background in foundational Chemistry. To provide an example, it would be impossible to provide students with a deep understanding of Biology without talking extensively about DNA and proteins. DNA, proteins, and the processes they're involved in within cells are all examples of applied Chemistry. Furthermore, there are a number of chemistry topics which can be difficult to attain full mastery of without an understanding of basic Physics. Given that, the Models sequence of courses starts with Physics, continues with Chemistry, and finishes with Biology. By ordering our content in this way, we hope that our students will more easily be able to see the connections between the content in their current course and what was learned the previous year. Lastly, we hope that our deliberate approach to vertically scaffold the content of our courses will leave our students more prepared to excel in each successive course.

Instructional Approach

The Models of Physics, Models of Chemistry, and Models of Biology courses will each employ the following learning cycle for each instructional unit:

1. Students are provided with a guiding question for which they develop their own investigative protocol. For example, students in the Models of Physics course may be asked to devise an experiment that helps them to investigate the impact that mass has on an object's acceleration.
2. Students then utilize the data they collect in order to answer the guiding question and develop a mathematical model which explains the relationship between the variables investigated in their experiment. For example, students in the Models of Physics course may be asked to utilize their data and graphs to develop a mathematical equation which helps them make predictions about the acceleration of an object with a particular mass.
3. Students compare both their experimental conclusions and mathematical models to accepted theories presented in Science textbooks. For example, students in the Models of Physics course may be asked to compare the mathematical model they created for predicting the acceleration of an object to the section of their textbook which discusses Newton's 2nd Law. Students would be asked to compare their experimental conclusions to the textbook theory and then provide potential explanations for any variations which exist between the two.
4. Students apply the mathematical models they created through experimentation to solve practical problems which help them deepen their understanding of the content topic in a particular instructional unit. For example, students in the Models of Physics course may be asked to predict the accelerations of both a bowling ball and tennis ball when subjected to a particular force.

All summed up, the instructional approach in all three courses will be consistent and very much focused on learning Science by doing Science. Teaching by telling will be avoided as teachers help students actively construct their own understanding for the content covered in that course. Students discussing their ideas, critiquing the work of peers, and learning from their mistakes will be common experiences in the course. All instructors who teach in the Models sequence will receive formal training on this methodology. For more information regarding this research-based pedagogical approach, please see the following link:

http://modelinginstruction.org/parents/

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Honors Credit

The Models of Physics, Models of Chemistry, and Models of Biology courses will follow an earned Honors credit model. Every student enrolled in a "Models of" course will be required to complete an extended research project as part of the curriculum. Time for work on this project will be incorporated into both regular class time and out of class homework assignments. Students should expect to have between 15 and 30 minutes of nightly homework for the course. Detailed grading rubrics and feedback on progress will be provided by each student's instructor throughout the school year. Students who earn both an A or B on the project and an A or B average overall for the course will be awarded Honors credit.

Preparation for Advanced Placement Courses

One of our most frequently asked questions is whether a student completing the "Models of" sequence will be prepared to take one of our Advanced Placement Science courses during their junior or senior years. The short answer is, "yes." In fact, students who excel in their Models of Physics and Models of Chemistry courses will likely be recommended to take AP Biology during their junior year instead of Models of Biology. Lastly, our first group of students who completed the "Models of" sequence enrolled in AP Science classes during the 2016-2017 school year. These students earned comparable grades to their peers who took our "Honors" Science sequence and exceeded state averages on their AP Exams.