



Portraits of Excellence

Summer 2005

Spotlighting Innovation and Success in the Hopewell Valley Regional School District

Building Skills to Last a Lifetime

When the details are coming apart for her – when the wires are falling off her kids’ robot, when the motors stall during competition and when the airline flies her students to one city and their equipment to another – science teacher Mary Yeomans thinks about Cliff Ludwig.

A former student, Ludwig interned last summer for a company that designs robots used to detect leaks in municipal water pipes. When the firm ordered a milling machine, no one realized until it was delivered that none of the company’s brilliant designers knew how to operate one. No one, that is, except Ludwig.

“Now he’s an important person at that company and it’s because of what he learned here in Robotics Club,” says Yeomans with not a small measure of pride.

And that, says the veteran physics teacher, is the real value of the ultra-successful Robotics Club, which, since its start in 1996 with a 3-foot-high robot made of scrap wood and powered by an old car window motor, has qualified three times for international competition.

Robotics, insists Yeomans, is not simply about churning out future engineers and computer programmers. Like all good science, it is about developing the kind of critical thinking skills that are essential to successful lives after graduation.

That is the mindset that drives the entire science department at Central High School where a challenging curriculum, an expansive array of extracurricular opportunities and an exceptionally

strong teaching staff have helped develop and nurture an outstanding program.

The program’s depth is evident on many fronts: in the extraordinary success of students on rigorous tests and outside competitions, in the popularity of science electives, and in a long tradition of offering courses in emerging fields of scientific study.

Stream studies and hawk watches, for example, have been a part of the CHS curriculum for more than two decades – a reflection of the community’s environmentalism. Human anatomy and physiology, a freshman-level course on most college campuses, has been taught here for more than a decade, as well as, with less regularity, biochemistry, extremely rare in high school. Physics has been a required course for graduation since 1999.

Among the more extraordinary enrichment opportunities available in recent years is the Astrophysics Summer Institute at Rutgers University. For the past four years an anonymous donor has sponsored several CHS students and a faculty member to attend the intensive, four-week program, helping astrophysicists collect and analyze data from satellites.

“It’s not even a college-level experience,” says Yeomans. “It’s more of a graduate-level experience.”

Robotics came to Hopewell Valley by way of the Princeton Plasma Physics Laboratory, which wanted to sponsor a high school team for

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Mary Yeomans and junior physics students Shannon Hohlbein and Brittany Keeler



Physics has been a required course at CHS since 1999.

Building Skills (Cont'd from cover)

the new FIRST competition that was starting up in New Jersey. Launched by inventor Dean Kamen, FIRST – For Inspiration and Recognition of Science and Technology – Robotics competitions were intended to inspire student excitement about the science, math and engineering fields. With financial support from private industry, high school teams were challenged to design, build, and in competitions against other schools, direct their remote-controlled robots around a course.

Since 1996, when Yeomans and then-metal shop teacher George Berrien met with 10 students after school, the club has grown steadily. This year, 28 students joined Team S.P.I.K.E., and their robot, constructed off a skeleton of PVC piping, performed well enough to help them capture 2nd place in the Philadelphia regional competition and an invitation to the international, held in Atlanta. Their trophy collection and list of sponsors – Bristol-Myers Squibb is now their largest – continue to grow.

The science program has also benefited from a faculty well-known for its expertise and intellectual rigor. Yeomans, selected the 2005 Science Teacher of the Year for the Delaware Valley by the tri-state's professional engineers, has been penning questions for the Sat II Physics exam for two years. Biology teacher Cindy Glover, one of five CHS science teachers to win the Governor's Teacher of the Year award, is the head reader for the PRAXIS, the state's science teacher certification exam, and has worked for the Educational Testing Service, writing practice questions for student test guides. Karen Lucci, another biology teacher winner of the Governor's Award, is credited with keeping the extracurricular Science League competitive and popular. And Dr. Lillian Rankel, who teaches chemistry, came to CHS after a 22-year career in industry. She holds 30 patents, most of them for her work in the petroleum industry where she helped develop cleaner ways to burn gasoline. Along with fellow chemistry teacher/science supervisor Trudy Iwanski, Dr. Rankel was one of four Hopewell Valley teachers invited to Princeton University last summer to demonstrate effective instructional techniques to other teachers.

The program's steady expansion, which helped it win 8 new, fully-equipped labs in its own 12,000-square-foot wing in 1997, continues. By last fall, it had outgrown its new space; two classes, AP

Physics and Earth Science, met in the business department.

One of the more gratifying elements about the CHS science program, particularly to a faculty that is predominantly women, is the high visibility of female students.

Glover says it has been that way since she first arrived as a student teacher in 1977 and she believes it has much to do with the high number of science professionals who live in the Hopewell Valley. "I have never not felt parental support," she says.

"I think the reason a lot of girls here do well in science," believes Dr. Rankel, "is because they also do sports. They're not little shrinking violets. Or, if they don't do sports, they're doing other things that give them confidence."

Helping her students appreciate the real connections of science to their lives is why Dr. Rankel shares professional journals with her students, prods them into competitions and assigns projects on science-related careers, in fields as diverse as cosmetology and astrology.

Yeomans, too, has broadened the appeal of Robotics by trumpeting the variety of skills that contribute to a successful club – marketing, public relations, Web design, animation, photography and videography, budgeting and fundraising.

This year's team is a good example. Following a disappointing 16th place finish at the Trenton Regional competition, Yeomans took her team to the Philadelphia Regionals. Instead of trying to do everything well, they would concentrate on one task and do it superbly. She also dispatched 12 students, nearly half of her 28-member team, with clipboards, laptops and video cameras to scout the competition. At FIRST competitions, it's not enough to just build the better machine; winning also hinges on teamwork. Just like real life. The change in strategy worked. Out of a field of 55, they finished 2nd, qualifying them for the international competition.

"I tell my students on the first day, 'I don't expect you to all be physicists.' But if you can learn how to tackle a problem, how to think, how to use what you know and figure it out - that's a skill you will use for the rest of your life. It's not about learning stuff and spitting it back. It's about thinking logically and working until you have an answer." ❀

A message from Trudy Iwanski, Supervisor of Science, Grades 6-12

Sister Maria Cordes, my college English professor, once confessed that she was jealous of the students majoring in science. They not only saw the beauty of the rose, she explained, but understood it on a molecular level. Sister's confession is one of my fondest college memories and became part of my personal philosophy of education: *Science gives another view of the world. Science is for all students.*



Through the study of science we gain understandings that enrich our lives in so many ways. Science enables us to not only enjoy riding on roller coasters but understand how they work. Science helps us understand the human genome project, along with its potential and liabilities. Science helps us understand how drugs affect the neurons in our brain and what the combustion engine does to the Earth's atmosphere.

In Hopewell Valley, the goals of the science department are to make all students science literate, to prepare those interested in science for upper-level courses in college and to give all students another method of perceiving the world. We also want them to be able to make good decisions as citizens. Scientific literacy is the knowledge you need to understand public issues. Science and technological issues dominate national debate from the greenhouse effect to stem cell research. Being able to understand these debates is becoming as important as the ability to read.

It is critical that we continue to embrace the tradition of excellence that has been the cornerstone of the science program. All students – those who will seek advanced science degrees and those who will never take another science course – will be called upon to serve the community at large. As community servants, the civic leaders and citizens of tomorrow will have to be able to develop a logical thought process, to gain an awareness of the impact of science and technology on their lives and to become well-informed responsible citizens of today's world.

Over the years our staff has won national awards and grants. Our students have been third in the North American Envirothon competition and ranked high in state and national competitions from Chemagination to Robotics. Our students have graduated from some of the nation's most prestigious universities with MDs and PhDs in many different scientific areas. These are wonderful achievements, but the most important one of all is their development into citizens who are capable of making good decisions based on scientific method and research.



Supervisor of science for Timberlane Middle School and Central High School since 1980, Trudy Iwanski holds a statewide profile among science educators. She was named the New Jersey Science Supervisor of the Year in 1997 and is a past president of the New Jersey Science Supervisors Association. For many years she served as co-chair of the New Jersey Science Convention, which annually draws 2,500 science educators from across the state. A former high school physics and chemistry teacher in Old Bridge, Mrs. Iwanski taught chemistry at Hopewell Valley, in addition to authoring several grants, including two \$25,000 awards from the Nabisco Co., used to help buy the first computers for the high school's science labs. She also helped design its 12,000-square-foot science wing, opened in 1997. Mrs. Iwanski, who retires in June 2005, holds a bachelor's degree in chemistry from Georgian Court University and a master's degree in science education from Rutgers University.



Katelyn Pagano shares handwriting analysis from the Jon Benet Ramsey murder case

The investigator, methodically and without emotion, reviewed the evidence: an open basement window, a heart drawn on a lifeless right palm, a 2 ½ page ransom note. She pointed out the absence of footprints in a snow-covered landscape and a mountain of physical evidence contaminated by grieving survivors.

Inconsistencies and ironies and sloppy police work all over the place.

At the conclusion of the investigator's impressive PowerPoint presentation, there was little doubt about who she believed murdered the little girl. She defended her opinion, deflecting suggestions about other potential suspects and ignoring those trying to rattle her concentration. "I always thought Jon Benet Ramsey was a guy," someone cracked.

For investigator Katelyn Pagano, an 8th grade student at Timberlane Middle School, the unsolved murder of the 6-year-old beauty queen was an irresistible subject for her end-of-the-term assignment in Forensics class.

Long before CSI, and the popular TV show's various electronic offspring, students at Timberlane began studying crime investigation techniques and procedures. It was 1998 when science teachers Ellen Thomas-Covell and Ellen Bocchieri spied materials for crime scene investigations in a supply catalog and thought it could make an intriguing course for middle school students. By 1999, their "Crime Scene

Biology, Chemistry and Forensic Entomology

Investigations: Real Life Science" class was part of the 8th grade CORE curriculum where it remains today as a nine-week, required course.

This isn't the footprints-and-blood-stains work of tired, B-movie gumshoes. Timberlane students are learning about forensic entomology – the use of carion-eating insects to approximate a time of death – and the multiple clues harbored by a single shard of broken glass. They learn about the secrets all skeletons keep -- including sex, lifestyle and disease – and that, like fingerprints, every human lip is unique.

For a dose of reality, teachers have drafted professional forensics specialists, such as New Jersey State Police scientist Ed Gainsborg, who have shared real-world stories and conducted demonstrations for students. Gainsborg, a Timberlane parent and a member of the Board of Education, has testified widely on crime scene evidence and, outside the FBI, is one of just eight, FBI-trained experts in hair DNA analysis in the U.S.

It is courses such as Forensics, with its exciting, real-world feel and heavy reliance on critical thinking skills, that demonstrate Hopewell Valley's commitment to science instruction that is fresh, relevant and challenging.

In 1994, Introduction to Physical Science, once a required 9th grade course, was moved to 8th grade, to better position incoming high school freshmen for a more rigorous science curriculum.

And challenging extracurricular activities, like the popular Robotics Club, which has developed into a valuable feeder program for the highly successful high school club, are helping the school maintain that edge.

Science educators at Timberlane also appreciate the value of competition which is why they took a team of students to this year's New Jersey Science Olympiad, a competitive tournament emphasizing problem-solving skills and teamwork. Central High School has participated with much success for many years, but this year was the first time students from Timberlane entered the event. The 15-student team, all 8th graders, finished 19th in a field of 55 statewide and took home the tourney's Spirit trophy, a much-better-than-respectable performance as far as adviser Ron Schott is concerned.

"We're competing against incredible science skills in New Jersey," says Schott, noting that the 1st

place winner in New Jersey also won the national championship.

Schott is so pleased with the students' experience and enthusiasm that he hopes to add a 7th grade team next year and a 6th grade team the following year.

Like its counterpart at Central High School, Timberlane's science faculty is also distinguished by its aggressive pursuit of professional development, which is why all middle and high school science teachers not only meet – but exceed – federal criteria for classification as "highly qualified" teachers, uncommon among middle schools.

This commitment to excellence is evident in teachers like Carol Stratman and Nadia Warriner, who last year won fellowships through the Earthwatch Institute to work alongside university researchers in Latin America.

Warriner, who teaches 6th grade, studied tropical reptiles in the Pantanal in Brazil; Stratman, who also teaches 6th grade, studied coastal cacti in Mexico. This summer Stratman will join 10 other New Jersey teachers who will travel to Costa Rica to study songbirds as part of a teacher exchange. A past winner of the Teacher of the Year award and the district's long-time environmental/outdoor education teacher, Stratman holds two post-graduate degrees in science education.

The high caliber of Timberlane's science faculty is well-known among educators outside the district. Thomas-Covell was one of four Hopewell Valley teachers invited to participate in the CONNECT-ED Summer Institute in Chemistry at Princeton University last summer, demonstrating effective instruction models to other teachers. Veteran teacher Rick Byer, along with Warriner, won coveted spots in Princeton's Teachers as Scholars program this year.

For the last seven years, Schott has been an evaluator for the National Board of Professional Teaching

Standards, which awards the gold standard in teaching, national accreditation, through a series of rigorous tests and portfolio. Schott has also been a scorer for the PRAXIS, the state's certification exam for secondary science teachers, for the past three years.

Schott, one of three Forensics teachers at Timberlane, believes any science program is relative only when it is helping students make the connections between the curriculum and the real world. "Whether you are becoming a teacher, a forensic scientist, a lawyer, or a parent, every career necessitates providing evidence to support your accomplishments, ideas or values," he said. "The curricular and extracurricular science offerings at HVRSD nurture a student's ability to explore, to present findings, to make conclusions, and to extend to real-world applications." ♣

Excelling Outside the Classroom

Team S.P.I.K.E. (robotics)	2nd place, FIRST, Philadelphia Regionals, 2005 General Motors Industrial Design Award, 2005 Xerox Creativity Award, 2002 1st place, FIRST, New Jersey Regionals, 2000 1st place, FIRST, Philadelphia Regionals, 2000 Honeywell Leadership in Control Award, 2000
Canon Envirothon (environmental science)	2nd place, New Jersey, 2005 3rd place, North America, 2004 7th place, North America, 2003
Conqueror of the Hill (physics)	3rd place, New Jersey, 2005
TEAMS* (engineering)	1st place, regionals, 2005
Chemagination** (chemistry)	1st place, U.S., 2004 2nd place, Regional, 2005
Toshiba ExploraVision*** (technology invention)	honorable mention, U.S., 2005

*Has placed 1st 9 of last 10 years

** Entered competition for first time in 2004

*** Entered competition for first time in 2005



All science teachers at Timberlane and Central High School meet federal "highly qualified" criteria.

Keeping Science Vibrant, Relevant for Hopewell Valley Youngsters

As school years go, 2004-05 proved to be a remarkably auspicious one for the 4th grade teachers in Hopewell Valley.

Hurricanes lashed the South, a tsunami devastated the Far East, a rain-swollen Mississippi River flooded the Midwest and a wayward beluga delighted the Delaware Valley.

For teachers required to build an entire year of science around the theme of water, the world's natural disasters – along with the lost whale – presented terrific teaching opportunities.

Hopewell Elementary teacher Eileen Sweeney took full advantage. The water theme spilled over into math (students calculated the size of the tsunami's deadly waves and the coastline of the Eastern U.S.), social studies (they memorized the 11 states that touch the Mississippi) and language arts (they shared the adventures of ichthyologist Eugenie Clark in *Shark Lady*.)

And that, says Sweeney, is the value of the thematic approach to science: sticking with one scientific concept or principle throughout an entire year allows a teacher to help students make the connections that validate the importance of science in everyday life.

"A lot of (facts), taught in isolation, mean nothing to them," says Sweeney. "When it's all tied in, there are more teachable moments. I never have to say 'well, we're done with that. We've moved on.'"

Many of the district's elementary teachers, as well as K-5 science supervisor Dr. Ida Chiaradia, agree. That's why a group of them, wrapping up an intensive review of the science program, are recommending that all elementary science classes be taught thematically. Currently, only 4th grade is taught that way.

Not only does thematic science instruction make sense educationally, but it helps teachers deal with a thornier problem: the dwindling amount of time in the elementary school day for science. It is an issue for many high-performing districts, including Hopewell Valley, trying to strike a balance between core subjects and enrichment studies, such as art, music and World Languages.

Teachers have been feeling the time pinch most acutely since 1999 when the state mandated World Language instruction beginning in 2nd grade. Not long after, the daily instructional time for math was increased, from 42 to 60 minutes. The two changes consumed a total of 4 ½ periods a week.

In the meantime, the classes known as "specials" – music, art, computer, library, gym – continued to expand, squeezing the school day even more. Regular computer instruction begins in 3rd grade and by 4th grade, students are eligible for as many as three music classes. By 5th grade, four music classes are available.

What is left over for science and social studies is down to as little as 2 ½ periods, or 1 hour and 45 minutes, per week. Some weeks, it's not even that much. Because social studies and science are the two subjects when a teacher has her entire class – no pullouts for advanced or remedial instruction, for example – they are often the only opportunities for whole-class activities, such as seasonal celebrations. In order to be fair, a teacher often has no choice but to tap into these periods for group activities.

One thing is clear: by the time students reach 5th grade, they spend quadruple the amount of time in classes known as "specials" – art, music, library, Spanish and physical education – as they do in science class.

"Two and a half periods in a week is just not enough time to teach science," insists Dr. Chiaradia.

One of the other issues under study is the classroom instruction itself. Since 1998, elementary science in Hopewell Valley has been taught through the use of "kits" – boxed sets of materials conducive to hands-on

projects. The "sound" kit, for example, carries, among other things, a plastic cup, rubber band and noisemaker for a lesson on the eardrum.

Assembled by a private company, the kits came free of charge – the cost was underwritten by Bristol-Myers Squibb – and were introduced, by grade level, in waves. Once the kits are used in one school, they are returned to the company for re-stocking and then delivered to another school.

Conceptually, they were embraced as good examples of hands-on, inquiry-based instruction – the way science is supposed to be taught, according to the experts. They also carried the promise of consistency in instruction.

For all their convenience, however, the kits require considerable set-up time; sometimes they are missing contents. What's more, teachers have varying levels of comfort teaching with the kits, so, consequently, there are uneven levels of kit usage.

To help teachers become more comfortable with the science kits, the review committee is urging formal training for teachers in how to use the kits before they show up in the classroom.

One reason why the kits are considered so important is that they are compatible with the Atlas of Science Literacy's Project 2061, a research-based curriculum guide promoted by the country's leading science educators. A long-term initiative of the American Association for the Advancement of Science, Project 2061 endorses the use of age-appropriate, hands-on activities in science education. Last year, Hopewell Valley's entire K-12 science curriculum was aligned to the Project 2061 model.

Kit usage is of particular concern right now to elementary science reviewers because New Jersey, for the first time ever, is testing 4th graders in science. This year's 4th graders were the first group to take the New Jersey Assessment of Skills and Knowledge (NJ ASK) test, and educators expect the results to reveal how, if at all, the elementary science program should be changed. As it happens, Sweeney was one of 20 elementary science teachers statewide selected to help determine proficiency standards for the science portion of next year's test.

In the meantime, Hopewell Valley educators continue to seek creative ways to excite youngsters about science.

With the help of scientist parents, Toll Gate Grammar School last year organized a Science Night, inviting researchers and professors from Princeton University to give table-top demonstrations to students and their families. The event was so well-received that two more were held this year. The last one, held in April, featured scientists from Princeton University's Institute for the Science and Technology of Materials (PRISM) and offered up-close demonstrations of a range of principles, from DNA to fluid dynamics.

Kate Napolitano, new principal of Stony Brook Elementary and a former science supervisor for East Windsor schools, is an enthusiastic campaigner for creative science initiatives. At East Windsor, she wrote an interdisciplinary course that offered credit in both science and Honors English. And in Bordentown, where she worked as an elementary principal, she arranged for youngsters to give PowerPoint demonstrations on what they were learning to students at the local high school. "Not that what we'd done was completely unknown to them, but it was different," she explained. "And for the younger kids it was very meaningful to present to the big kids." ❀



Bear Tavern students Mandy Lee and Megan Webb find a starfish on Long Beach Island in June. The annual beach trip is the culminating science activity for the district's 4th graders after a year studying water.

