

PASCO Academy: Chemistry (PA-1120)

Welcome to PASCO Academy: Chemistry 1! This interactive, instructional tool is accessible to teachers from September 1, 2020 to January 31, 2021, and includes 15 full weeks of instructional resources, plus an interactive coaching and mentoring forum. PASCO Academy: Chemistry 2 begins January 1, 2021 and continues through the end of June 2021.



PASCO's highly qualified chemistry Instructors provide a full semester (15 weeks) of phenomena-based, distance learning topics complete with instructional support, faculty coaching, lab demonstrations and data collection videos, sample data files for student analysis and follow-up explanations. Former educator, Mr. Roger Palmer, and textbook co-author, Ms. Barbara Pugliese, will use the *Essential Chemistry* book to supplement your institution's existing curriculum, while supporting students and faculty with the

instructional resources, lab demonstrations, and professional development. Complete biographies for each of our Instructors can be found on the [Academy website](#).

Each week of PASCO Academy Includes:

- Digital student and educator resources for the weekly lab investigation, including an editable student lab handout, editable teacher key, and links to additional instructional resources within the *Essential Chemistry* e-Book
- An educator-directed video segment in which PASCO Instructors explain the weekly phenomena-based lab topic, discuss relevant instructional and laboratory resources, and share strategies for content delivery and distance learning
- A student-directed video segment in which PASCO Instructors conduct the weekly pre-lab demonstration(s), explain the equipment set up, collect data using PASCO sensors, hardware, and software, and pose questions for students to consider during their analysis
- Sample data file(s) for students that contain all the data collected during the weekly laboratory investigation
- A second student-directed video segment that presents deep analysis of the data from the investigation, while providing additional insights and assistance with answering difficult questions from the student materials.
- Educator-access to an online forum curated by PASCO Instructors and content specialists where educators can interact with the Instructors, ask questions and utilize Academy resources for coaching and mentoring.

Support Resources:

- All files and other digital resources are provided in formats that easily integrate into learning management systems.
- Faculty and students receive the recorded activities, data sets for analysis, and follow-up videos with the Instructor's analysis of the data.
- Faculty and students receive complete access to the *Essential Chemistry* curriculum and e-Book, which include electronic student and teacher versions, interactive animations and simulations, student worksheets with answer keys, teacher lesson plans, PowerPoint presentations, teaching tips, and tools for formative and summative assessment.
- Faculty receive complete access to the *Essential Chemistry* Test Bank.
- Faculty and students receive a site license for PASCO's award-winning SPARKvue data-collection and analysis software, which permits students and faculty to install the software on computers and devices at home.

PASCO ACADEMY

DISTANCE AND HYBRID LEARNING SOLUTIONS



Online Platform and Academy Portal:

The PASCO Academy resources are made available to faculty through the [PASCO Academy website](#). Once purchased, the website and resources become available to all faculty within the school. PASCO **does not** track educators' usage or charge for individual educator accounts. Educator accounts are created in the first login. After creating an account and logging in, the forum and student/faculty

resources will become accessible through the Academy Portal. The Academy is provided as either: (1) a license to the school and all users within that school - regardless of the number of faculty or (2) a license to a single educator and their course of fewer than 100 enrollees. Resources within the Academy Portal may be shared freely by the educator; Students will not have direct access to the Academy Portal. The PASCO Academy **does not** monitor student usage of the Academy resources. Student data is not collected nor are student accounts created within the Academy. As such, there are no reports to generate and no student data to protect.

The Academy Forum:

Educators who participate in the Academy have access to discussions within the [Academy Forum](#). Here, faculty are provided with weekly insights about the lessons and activities to be covered, as well as links to important resources and suggestions for achieving success in the classroom. Educators may ask PASCO Faculty time-relevant questions and will receive important coaching and mentoring on techniques used for distance, hybrid and in-class learning. Each week, there will be new discussions about the weekly content and resources. Our Academy Faculty have many successful years of instructional experience to share with educators in the Academy Forum.



We fully recognize that schools and faculty may be teaching different topics at different times, and we have accounted for this by providing open forums each week. This enables an educator seeking assistance with material from Week 1 to have the same synchronous support as an educator starting lessons from Week 3. To allow for faculty autonomy and varied district schedules, we will provide 15 weeks of consecutive lessons with interactive forums until the end of January 2021. PASCO Academy: Chemistry 2 begins January 1, 2021 and continues through the end of June 2021.

Throughout the 15 weeks, our Instructors will provide some insights on successful strategies and lab activities to support the earth and space sciences. There will be special topics that offer faculty opportunities to present activities in ocean acidification, carbon cycling, properties of water on a living planet and others as they relate to traditional chemistry content. By making the Academy Forum open to these special events, we hope to provide some structure to faculty who may be searching for ways to incorporate these new topics in their course sequence. Special topics that support this model are included in the provided syllabus.

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Special Topics in Chemistry:

Energy in Earth's Systems and Human Activity

Cycling of Carbon Among Earth's Spheres

Properties of Water and Effects on Earth



Additional Training:

PASCO offers free webinars and a library of support videos that cover a wide range of applications, from the foundations of software usage to advanced applications, such as coding and computational thinking. Educators may join any of our free webinars to enhance their skills, browse the video library, or share selected video links with students who may need some assistance.

Professional Development Certificates:

Faculty participating in the PASCO Academy have the option of receiving a 16-hour professional certification hours (in-service) as part of the school or district PD plan. PASCO Powered educators will develop skills and strategies through mentoring, coaching and interactive forums.

Online Access to Essential Chemistry:

The Essential Chemistry curriculum is available to both students and faculty through the Essential Chemistry Portal. Two user access keys — one student key and one teacher key — are provided to the school or district to be shared freely with faculty and students. The curriculum portal does not collect student data nor information and cannot collect or generate student usage reports. The portal provides resources that may be assigned by the faculty and used freely to support their instruction. The Essential Chemistry Portal has a simple URL that can be shared without a need for rostering or roster updates.

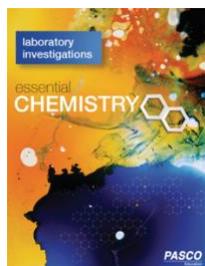


Teacher Access: [Teacher.PASCO.com](https://www.pasco.com/Teacher)
Student Access: [Student.PASCO.com](https://www.pasco.com/Student)

Student User Codes: A student user code may be provided for advanced evaluation by [contacting your local sales representative](#).

Standards Alignment: *Essential Chemistry* is aligned to your state standards. [Contact your local sales representative](#) for access to your e-book and standards alignment information.

Essential Chemistry Curriculum



Overview: The *Essential Chemistry* e-Book features all of the content in the print textbook, as well as interactive features, such as simulations and equation solvers that help bring difficult concepts to life. To support science literacy, glossary words are defined in context, and the definitions can be read aloud in English and Spanish. Each page is focused on a single topic and is presented in an outline format that helps improve reading comprehension. Solved Problems guide students through mathematical content and “Test-Your-Knowledge” questions provide opportunities for formative assessment with immediate feedback. “More” paragraphs and end-of-chapter readings include additional content that appeal to students’ interests to help them see a direct line from the content to real-life STEM applications. The

“Take-A-Quiz” feature at the end of each section allows students to review a question or concept until they achieve mastery.

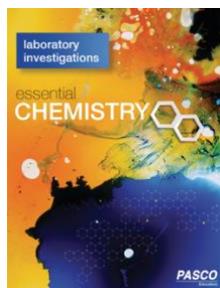
Infusing rigor, PBL and technology: The Essential Chemistry curriculum focuses on practical applications that connect students to Chemistry concepts that are relevant to life, earth, and the physical sciences, while incorporating mathematics, technology, and engineering practices. It includes labs that are coordinated with the textbook and e-Book. Many of these investigations use PASCO’s Wireless Sensors and SPARKvue software, which are provided as part of the Academy package. Using this equipment to conduct hands-on labs, students can quickly develop concepts without long data collection times and spend more time making important connections between macroscopic phenomena and microscopic particles. Sensor-based lab investigations allow students to use technologies similar to those used by scientists in the field, while PASCO software helps them develop data visualization and analysis skills. Engineering design projects motivate students to engage in the engineering design process, while cross-cutting concepts to reinforce content woven through multiple disciplinary core ideas.

Progress monitoring and resources: The Essential Chemistry digital teacher edition includes lesson plans, PowerPoint slide presentations, student work, and answer keys. Each lesson follows a 5-E learning cycle design, with opportunities for differentiation. To assist with progress monitoring, all lesson presentations include pre-lesson and post-lesson assessment questions to help faculty and students gauge student learning and readiness for summative assessment. The “Take-A-Quiz” feature at the end of each section allows students to review a question or concept until they achieve mastery. An infinite test bank is also included with the program.

Essential Chemistry Resources:

Full access to *Essential Chemistry* provides instructors with additional resources for chemistry instruction including:

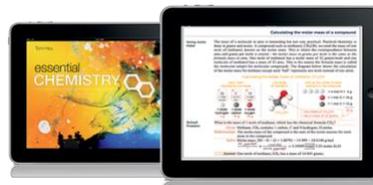
- Distance learning videos and data sets
- Innovative and interactive media
- Flexible assessment options
- Interactive simulations



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- 71 complete investigations
- 4 Engineering Design Projects
- Section and chapter reviews
- 100% Full Teacher Resources



PASCO Academy: Chemistry Sample Agenda

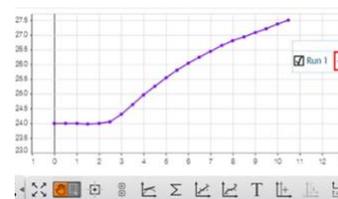
Week 3, Topic 3: Classifying Matter, Lab 3C – Physical or Chemical Change

1. (Faculty only) Faculty are provided with the weekly PASCO PD to clarify questions from Week 2 and to gain insights on the lesson for Week 3. Distance learning resources will be showcased with links to important online investigations, animations, and simulations. PASCO Instructors will also share best practice strategies for online science instruction to support distance learning.

2. (For Students) PASCO Academy provides a laboratory investigation on a key, standardized chemistry phenomenon. An Instructor conducts the investigation using demonstration and questioning techniques that provide students with opportunities to develop a deeper understanding of the content. Each activity is designed to engage students without simply providing them the answers to important questions. Students may be directed to key content within the Essential text to assist them in performing their analysis of the investigation. Students receive a copy of the collected data and access to PASCO software to facilitate deeper investigation and analysis of the phenomena. To assist participating faculty, PASCO Academy Instructors will model techniques for science inquiry and quality distance learning processes, which may be reproduced by on-site faculty for continued student engagement.



3. (For Students) PASCO Instructors provide a deep analysis of the Week 3 laboratory investigation using software tools and relevant simulations to help drive content development. Students will be provided with opportunities to examine their understanding of the content while learning from their own analysis of the laboratory investigation.



4. (Faculty only) An online community forum will be open for continuous discussions about the weekly topics, misconceptions, teaching tips and resources. The forum will be maintained and moderated by PASCO Academy's Instructional experts.

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Mr. Boyd@Atlanta: *are there any simulations to help with this topic?*

Barbara @PASCO Faculty: *Absolutely, there is a great interactive equation on page 79 and a simulation that ties the math to the concept. We will be demonstrating this in the week 4 teacher discussion video*

Mr. Boyd@Atlanta: *Thank you! I look forward to watching and learning*

Mr. Johnson@Houston: *I use that simulation to highlight contributions to science.*

Mr. Boyd@Atlanta: *Great Idea! Thank you Mr. Johnson. I would enjoy knowing more about your lesson!*

Mr. Johnson@Houston: *I have a rough lesson plan that I would be happy to share it with you.*

PASCO Academy: Chemistry Weekly Syllabus (15 weeks):

1. The Science of Chemistry: *Essential Chemistry* Lab 1A – Experimental Variables
2. Measurement and Analysis: *Essential Chemistry* Lab 2A – Density of a Solid
3. Classifying Matter: *Essential Chemistry* Lab 3C – Physical or Chemical Change
4. Temperature and Heat: *Essential Chemistry* Lab 4A – Temperature and Thermal Energy
 - a. **Special Topic:** Energy in Earth's Systems and Human Activity
5. Specific Heat: *Essential Chemistry* Lab 4B – Specific Heat
6. Chemical Compounds: *Essential Chemistry* Lab 5B – Naming Ionic Compounds
7. Household Compounds: *Essential Chemistry* Lab 5C – Store Labels and Model Building
8. Moles: *Essential Chemistry* Lab 6A – Counting by Weighing
9. Moles and Formulas: *Essential Chemistry* Lab 6D - Empirical Formula of Magnesium Oxide
10. Chemical Reactions: *Essential Chemistry* Lab 7B – Chemical Reactions
11. Solubility: *Essential Chemistry* Lab 7C – Solubility Rules
12. Stoichiometry: *Essential Chemistry* Lab 8A – Conservation of Mass
 - a. **Special Topic:** Cycling of Carbon among Earth's Spheres
13. Stoichiometry and Reactions: *Essential Chemistry* Lab 8D – Determining Limiting Reactants
14. Atomic Structure: *Essential Chemistry* Lab 9D – Flame Test
15. Bonding and Valence: *Essential Chemistry* Lab 10A – Types of Bonding & Lab 10B – Lewis Structures and VSEPR
 - a. **Special Topic:** Properties of Water and Effects on Earth



ESSA Support and Evidence:

The PASCO Academy provides opportunities supported by strong evidence in the areas of:

- Addressing at-risk students
- Development of academic language
- Providing rigor, PBL and technology
- Infusing progressive monitoring

The PASCO Academy and *Essential Chemistry* are grounded in the constructivist theory of learning, which uses the 5E learning cycle and encourages learners to actively construct their own knowledge as determined by their experiences. Research indicates that an educational experience built on constructivist learning theory tenets can change students' perceptions, attitudes, knowledge, and skills in the area of cultural competence (Hunter & Krantz, 2010). The Academy and *Essential Chemistry* both emphasize active participatory learning.

Active participatory learning is based on constructivism, which encourages direct, hands-on experiences with people, objects, events, and ideas. Children in active learning settings construct their own knowledge through their interactions with the world and the people around them. PASCO's sensor-based investigations provide extensive opportunities for students to develop scientific literacy and familiarity with the practices of science through hands-on experiences that utilize tools similar to those used by scientists and engineers. It is our goal to provide high-quality student equipment at a low cost that helps stretch precious science education resources further.

As cited in the white paper "[21st Century Science](#)":

Research confirms the positive impact of inquiry-based instruction on student understanding of science (Bredderman, 1983; Furtak et al., 2012; Minner, Levy, & Century, 2010; Schroeder, Scott, Tolson, Huang, & Lee, 2007; Shymansky, Hedges, & Woodworth, 1990; Weinstein, Boulanger, & Walberg, 1982).

Research and expert opinion confirm the value of technology to support student data collection, analysis, and visualization, including sensors and probes (Linn & Hsi, 2000; Krajcik & Mun, 2014; Kulik, 2003; Rogers & Finlayson, 2004; Webb, 2008).

Education experts specify that such technology is most effective in supporting student learning when it is used in an inquiry context (Krajcik & Mun, 2014; National Research Council, 2006; Webb, 2008).

Technology use should support students in actively constructing meaning; be situated in an authentic, real-world context; provide cognitive tools; support specific learning goals; and scaffold student capabilities (Krajcik & Mun, 2014).

Research supports the motivational value of incorporating scientific inquiry activities and related engineering design activities into instruction (Barron et al., 1998; Crawford, 2014; Cunningham & Carlsen, 2014; Fraser, Giddings, & McRobbie, 1995; Kolodner et al., 2003; National Research Council, 2006; Scanlon, Jones, & Waycott, 2005; Webb, 2008; Wong & Fraser, 1995).

Survey data shows that many students find hands-on experiences using technology both motivating and memorable (Farris-Berg, 2008).

As cited in the [case study for Harmony Schools in Texas](#):

In 2015-2016 and 2016-2017, all Harmony schools met or exceeded state academic standards set by the Texas Education Agency (TEA). In 2013, 100 percent of Harmony students passed the state's End-of-Course (EOC) assessment in physics, compared to the Texas statewide passing rate of 81.8 percent.

PASCO Academy - Physics & Chemistry

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With a college acceptance rate of 100 percent, Harmony Public Schools has earned a well-deserved reputation for providing a high-quality education. In addition, thanks to its powerful PBL approach to personalized STEM education, the number of Harmony graduates choosing STEM majors in college increased from 19 percent in 2010 to 60 percent in 2016. *Essential Chemistry* and *Essential Physics* are built on the same philosophical foundations.

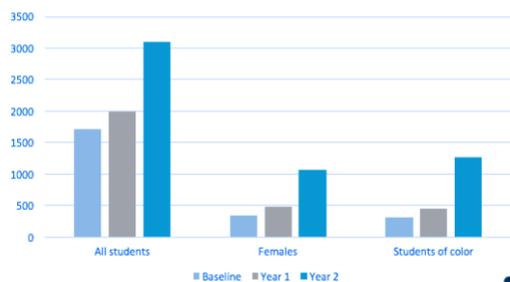
As cited in the white paper “[Brighton Gramm School Increases Student Learning](#)”:

They have found three distinct areas that are impacted by the shift in instruction: (1) Student engagement has increased learning; (2) There has been a positive impact on faculty as the tools and processes have changed their pedagogy; (3) The style of questioning has changed for both students and educators, which has led to much deeper learning.

Current Research funded by the Office of Naval Research (ONR):

Current research being conducted by Old Dominion University shows significant improvements in both enrollment and passing rates in schools across the sample group in Virginia. Old Dominion University is a public research university in Norfolk, Virginia. The use of *Essential Physics* and PASCO training is being studied over a 5-year period. The 2-year data is showing significant and measurable gains. *Essential Chemistry* and *Essential Physics* are built on the same philosophical foundations.

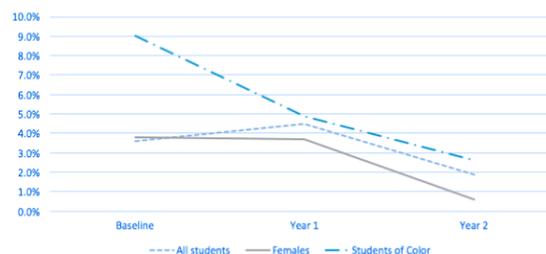
How has Physics enrollment changed since EP was introduced?



These numbers represent an 80% increase for all students, a 211% increase for females, and a 308% increase for students of color from 2017-2018 to 2019-2020.



How has EP influenced student achievement in Physics?



Substantial decreases were observed in the percentage of students who did not pass Physics, with significant reductions for females and students of color.



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Dr. JP Keener

Dr. JP Keener is a 30-year educator and the former K-20 Director for Mathematics, Science and STEM +C programs for the State of Florida. He holds degrees in chemistry, physics and education with an emphasis on curriculum development. He has worked on several state, national and international STEM projects and has published in several environmental, and educational venues as well as the Journal of the American Chemical Society. Dr. Keener has authored and co-authored books, e- courses, and extensive curricula for various institutions. His work, "Reading Across Science," was adopted by the State of Florida in 2009 as an essential supplemental curriculum to develop reading and learning strategies in science. Currently, Dr. Keener is the Lead Author for "Fundamentals of Science and Engineering," a national initiative for the country of Qatar. In higher education, Dr. Keener has served as the Department Chairman and Lead Faculty for the U.S. Air Force contracted University for the

Asia-Pacific region and has coordinated the development of STEM schools in Korea, Okinawa and Japan. Prior to that, Dr. Keener served as the Director of STEM programs for the Broward County School District in Ft. Lauderdale, Florida (5th largest District in the Nation). Dr. Keener has been an associate and adjunct professor of math, science and education for several universities, including Florida Atlantic University, Nova Southeastern University, Barry University, The University of Phoenix, Western Governors College and the University of Pittsburgh. He is a recipient of the Stafford Award of Teaching Excellence from the University of Pittsburgh. Currently, Dr. Keener serves as the Director of Curriculum and Professional Development for PASCO scientific. Dr. Keener holds a current instructional certification from the State of Florida.



Ms. Barbara Pugliese

Ms. Barbara Pugliese has more than 15 years of teaching experience across three different states at the high school and college levels. During her time teaching high school students, Ms. Pugliese specialized in Chemistry, while teaching other courses, including Oceanography, Environmental Science and Biology. As an adjunct professor, Barbara taught Introductory Chemistry and Technology for Educators. Throughout her teaching career, Barbara has made science meaningful for students by providing them opportunities to get hands-on with real-world science. Prior to joining PASCO scientific, Barbara worked as an Instructional Designer where she specialized in traditional, blended, and

directed study environments. When she's not delivering training to teachers around the world, Ms. Pugliese is at the PASCO headquarters designing and creating chemistry and biology curriculum. She is a co-author of the *Essential Chemistry* textbook, and the creator of PASCO's Biology and Chemistry lab manuals. Barbara holds a valid California teaching credential for Chemistry and Biological Sciences. Barbara earned her B.S. in Biology from California State Polytechnic University and her M.A in Educational Technology from San Diego State University.

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Mr. Roger Palmer

Mr. Palmer was born in North Dakota 200 years too late to have been part of the historic Lewis and Clark exploration of the Missouri River basin. His travels have led him to become the Chemistry, Biology, Earth and Environmental Science Product Manager for PASCO scientific. At PASCO, Mr. Palmer combines his 28 years of teaching with his experiences as science chair to design electronic tools for exploring the sciences. Roger has used his University of North Dakota master's degree in Chemistry to teach classes in Chemistry, Physics, Earth and Environmental Sciences, Applied Chemistry and Physics, Physical Science, and Life Science. Roger has provided teacher professional development on five continents, co-authored seven books, written over 180 science lesson sets, twelve professional research articles, and presented at hundreds of conferences. Roger has coordinated over 2 million dollars in grants at schools for professional development, science lab renovations, and student engagement activity monies throughout his career. He loves how stories lure their readers to unravel mysteries from information embedded in interactive maps. Thousands of teachers have joined Roger and his wife in offering more than 120 week-long technological adventures in locations stretching from Hawaii to the Rockies, the Great

Plains to the Great Lakes and Australia to Abu Dhabi. Roger has collaborated on projects with The National Geographic Society, NASA, the National Research Council, the American Association of Geographers, the National Audubon Society, Firewise Home Safety, the U.S. Golf Association, ESRI, PASCO scientific, Forestry Supplies, Frey Scientific, Chabot Observatory and many regional, outdoor educational centers worldwide.



Boomer

Meet the official PASCO "lab"! At 10-years old, Boomer is by far our youngest employee and the proud mascot of PASCO Laboratories. When he isn't sleeping, Boomer is actively bringing smiles and paw-shakes to the staff at PASCO scientific. It is most probable that Boomer will not be providing any of the instruction, but he may make a guest appearance while suited up with motion, light or sound sensors. According to Boomer, "There is great science to be experienced chasing birds!"