

# THOMAS C. PENTECOST, Ph.D.

Department of Chemistry  
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## Education

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- 2003      **Ph.D., University of Northern Colorado, Greeley, CO**  
Major Field of Study: Chemical Education (Dr. Loretta Jones)  
Dissertation Title: “Analysis of First-Year College Chemistry Students Knowledge About and Usage of Text”
- 1993      **M.S., Louisiana State University, Baton Rouge, LA**  
Field of Study: Physical Chemistry  
Thesis Title: “Flowing Afterglow Studies of Ion-Molecule Association Reactions: Characterization and Use of Different Carrier Gases”
- 1987      **University of Tennessee at Martin, Martin, TN**  
Degree: B.S. in Chemistry (ACS certified)

## Professional Experience

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- 2009 – present      **Assistant Professor, Chemistry Education - Grand Valley State University, Allendale MI**
- 2006 – 2009      **Professional Research Assistant, Chemistry Education Specialist, University of Colorado, Boulder, CO**  
Projects include:
- Development of first semester general chemistry concept survey
  - Development of a covalent structure and bonding learning progression and evaluation using Item Response Theory
  - Development recitation materials for use in student-centered recitation sessions in general chemistry
  - Development and implementation of TA training program to support student-centered recitation sessions
  - Evaluation of active learning strategies in physical chemistry courses
  - Development of first semester physical chemistry concept inventory
  - Supervision of undergraduate research project

- 1997 – 2006 **Professor, Aims Community College, Greeley, CO**
- Courses taught: General Chemistry, College Physics, Organic Chemistry, Allied Health Chemistry, Chemistry for Fire Protection, and Chemical Testing Technology
  - Responsible for development and revision of laboratory manuals for all chemistry courses
  - Served as Future Teacher Mentor as part of NSF funded program to recruit future math/science teachers.
- 1997 **Institute for Chemical Education (I.C.E.) Workshop Instructor, University of Northern Colorado, Greeley, CO**
- Co-instructor for a four week NSF workshop on physics for elementary, middle and high school teachers
- 1996 – 1997 **Adjunct Faculty, Aims Community College, Greeley, CO**
- Course taught: General Chemistry
- 1996 **Adjunct Faculty, Department of Chemistry and Biochemistry, University of Northern Colorado, Greeley, CO**
- Course taught: Liberal Arts Chemistry Course
- 1995 – 1997 **Graduate Research Assistant, Department of Chemistry and Biochemistry, University of Northern Colorado, Greeley, CO**
- Projects:
- Dissertation research: Validation of two existing instruments, using factor analysis, and development of a new instrument to characterize general chemistry students' knowledge and use of textbooks.
  - *ChemQuest* – NSF Sponsored high school chemistry curriculum: Developed and implemented an evaluation instrument. Observed high school classrooms and evaluated student use of curriculum
  - Rocky Mountain Teacher Education Collaborative – 5 Year/multi-institution NSF funded course revision project: Assisted in the development and evaluation (survey and interview methods) of a student-centered one semester survey of physical chemistry course
  - Courses taught: Freshman Chemistry Laboratories and Co-instructor: Survey of Physical Chemistry (three times)
- 1992 – 1995 **Science Teacher, Episcopal High School, Baton Rouge, LA**
- Courses taught: Chemistry, Honors Chemistry, Advanced placement Chemistry, Physical Science, and Conceptual Physics.
  - Sophomore class sponsor
  - Technical director for the theatre program

- 1987 – 1992 **Graduate Research Assistant, Department of Chemistry, Louisiana State University, Baton Rouge, LA**
- Temperature and carrier gas dependence of the rates of gas phase ion-molecule reactions using flowing afterglow
  - Determination of electron affinity of chlorine dioxide
  - Maintenance and modification of high vacuum experimental equipment and quadrupole mass spectrometer.
  - Courses taught: Freshman Chemistry Laboratory, Honors Freshman Chemistry Laboratory, Physical Chemistry Laboratory
- 1988 **Graduate Student Research Fellow, Universal Energy Systems, Dayton, Ohio**
- Performed gas phase ion-molecule research at the Air Force Geophysics Laboratory, Hanscom AFB, Massachusetts
- 1986 **Undergraduate Research Fellow, University of Tennessee at Knoxville, Knoxville, TN**
- Performed electron spin resonance studies of tetramethylurea radical cation in Freon matrices.

### **Publications – all peer reviewed**

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Thomas C. Pentecost & Jack Barbera. (2013) “Measuring Learning Gains in Chemical Education: A Comparison of Two Methods”. Journal of Chemical Education, 90 (7), p 839-845 (DOI: 10.1021/ed400018v)

Pam Scott & Thomas C. Pentecost. (2013) “What happens when a chemistry laboratory curriculum changes”. Journal of College Science Teaching, 42 (3), p 82-88

Thomas C. Pentecost, Laurie S. Langdon, Margaret Asirvatham, Hannah Robus, & Robert Parson, (2012) “TA Training that Integrates Pedagogy and Content.” Journal of College Science Teaching. 41(6), 68-75

Deanna M. Cullen, Thomas C. Pentecost (2011). “A Model approach to the electrochemical cell: An inquiry Activity.” Journal of Chemical Education, 88 (11), p 1562-1564 (DOI: 10.1021/ed101146u)

Thomas C. Pentecost\*, M.Lynn James (2000). “Assessment of a Student-Centered P-Chem Class”, Journal of College Science Teaching, 30, 122.

Thomas C. Pentecost (1999). Chemistry Reform Takes Root in University Setting. In M.L. Powers & N.K. Hartley (Eds.), Promoting Excellence in Teacher Preparation: Undergraduate Reforms in Mathematics and Science (pp. 1129-1134). Fort Collins, CO: Rocky Mountain Teacher Education Collaborative.

Lucia M. Babcock, Thomas C. Pentecost and W.H. Koppenol. (1989) "Electron Affinity of Chlorine Dioxide" Journal of Physical Chemistry, 93, 8126.

Xue-Zhi Qin, Thomas C. Pentecost, Jih Tzong Wang and Ffrancon Williams. (1987) "E.S.R. Evidence for Deconjugation in the Tetramethylurea Radical Cation" Journal Chemical Society, Chemical Communications, 450.

**Presentations**      *(Undergraduate researchers\*)*

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Thomas C. Pentecost and Jack Barbera, "Advantages of Rasch analysis using pre and post assessments in determining changes in students' conceptual understanding" Ohio River Valley Objective Measurement Seminar, University of Kentucky, May 3rd, 2013. **(Talk)**

Thomas C. Pentecost and Jack Barbera, "Measuring students' conceptual understanding using pre and post assessments and the Rasch model" 22<sup>nd</sup> Biennial Conference on Chemical Education, Pennsylvania State University, State College, PA, August, 2012. **(Talk)**

Thomas C. Pentecost and Julie Henderleiter, "Atoms First at Grand Valley State University: The how and why", 22<sup>nd</sup> Biennial Conference on Chemical Education, Pennsylvania State University, State College, PA, August, 2012. **(Talk)**

Kristen Simon\* and Thomas C. Pentecost, "Role of the Textbook for Students in Organic and Analytical Chemistry" 22<sup>nd</sup> Biennial Conference on Chemical Education, Pennsylvania State University, State College, PA, August, 2012. **(Poster)**

Jordyn Betz\*, Lacey Hamilton\*, and Thomas C. Pentecost. "The Role of Textbooks: Does the Course Content or Faculty Member Matter?" 22<sup>nd</sup> Biennial Conference on Chemical Education, Pennsylvania State University, State College, PA, August, 2012. **(Poster)**

Thomas C. Pentecost, "The effect of instructional decisions on student approaches to learning in chemistry" 2010 Scholarship of Teaching and Learning Academy – Eastern Michigan University, Ypsilanti, MI, May, 2010. **(Talk)**

Thomas C. Pentecost, "A Learning Progression for Structure and Bonding in Chemistry" 239<sup>th</sup> National Meeting of the American Chemical Society, San Francisco, CA, March, 2010. **(Talk)**

Thomas C. Pentecost, Laurie S. Langdon, Margaret R. Asirvatham, and Robert Parson, "TA Training that Integrates Pedagogy and Content" 237<sup>th</sup> National Meeting of the American Chemical Society, Salt Lake City, UT, March, 2009. **(Talk)**

Thomas C. Pentecost and Laurie S. Langdon, "Development of a Covalent Bonding and Molecular Structure Learning Progression and Concept Inventory for First Semester General Chemistry" 20<sup>th</sup> Biennial Conference on Chemical Education, Indiana University, Bloomington, IN, August, 2008. **(Poster)**

Thomas C. Pentecost, Laurie S. Langdon, and Robert Parson, "Implementation and Evaluation of Student-Centered Recitation Sections in General Chemistry" 235<sup>th</sup> National Meeting of the American Chemical Society, Division of Chemical Education, New Orleans, LA, April, 2008. **(Talk)**

Thomas C. Pentecost and Loretta Jones, "Analysis of First-Year College Chemistry Students Knowledge About and Usage Of Text" 19<sup>th</sup> Biennial Conference on Chemical Education, Purdue University, West Lafayette, IN, August 2<sup>nd</sup>, 2006. **(Talk)**

Thomas C. Pentecost and M.Lynn James, "Assessment of a Student-Centered P-Chem Class", 15<sup>th</sup> Biennial Conference on Chemical Education, Waterloo, Ontario, Canada, August 11<sup>th</sup>, 1998. **(Talk)**

Gerald Saunders, Meg Chaloupka, Carolyn Dawson, Tom Pentecost, John Saunders, and Brad Tripp, "Laboratory Skills and Competencies for Secondary Science Teachers", 15<sup>th</sup> Biennial Conference on Chemical Education, Waterloo, Ontario, Canada, August 11<sup>th</sup>, 1998. **(Poster)**

Thomas C. Pentecost, K.C. Holder, and M. Lynn James, "Student Centered Learning of P-Chem: Phase 2", 68<sup>th</sup> Meeting of the Colorado/Wyoming Academy of Science, Denver, CO, April 25, 1997. **(Talk)**

Thomas C. Pentecost and M. Lynn James, " Student Centered Learning of P-Chem", 211<sup>th</sup> National Meeting of the American Chemical Society, Division of Chemical Education , New Orleans, LA, March 1996. **(Talk)**

Clark Fields, Lynn C. Geiger, Loretta Jones, Belia Straushein, and Tom Pentecost, "Interactive Learning Strategies: How Do We Know They Work?", 211<sup>th</sup> National Meeting of the American Chemical Society, Division of Chemical Education , New Orleans, LA, March 1996. **(Poster)**

Thomas C. Pentecost and Lucia Babcock. "Characterization of Argon and Nitrogen as Buffer Gases for Flowing Afterglow Studies", 199<sup>th</sup> National Meeting of the American Chemical Society, Division of Physical Chemistry, Boston, MA, April 1990. **(Poster)**

Thomas C. Pentecost and Lucia M. Babcock. "Gas Phase Ion-Molecule Reactions of Carbocations: Radiative Association Reactions", Second International Conference on Chemical Kinetics, National Institute of Standards and Technology, Gaithersburg, MD, July 1989. **(Poster)**

Thomas C. Pentecost and Lucia M. Babcock. "Gas Phase Ion-Molecule Reactions of Carbocations: Radiative Association Reactions", 37<sup>th</sup> American Society for Mass Spectrometry Conference on Mass Spectrometry and Allied Topics, Miami, FL, May 1989. **(Poster)**

Thomas C. Pentecost, "Ion-Molecule Radiative Association Reactions", 12<sup>th</sup> Annual Area Collegiate Chemistry Meeting, University of Tennessee at Martin, Martin, TN, April 1989. **(Talk)**

Thomas C. Pentecost, "An E.S.R. Study of Radical Cations in Freon Matrices Produced by Radiolysis", 10<sup>th</sup> Annual Area Collegiate Chemistry Meeting, University of Tennessee at Martin, Martin, TN, April 1987. (*Talk*)

### **Professional Affiliations and Service**

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Member: American Chemical Society – Division of Chemical Education,  
New Member Committee  
International Society for the Scholarship of Teaching and Learning  
National Science Teachers Association

Reviewer: *Journal of Chemical Education*  
*Journal of College Science Teaching*  
*The Chemical Educator*

Textbook Reviewer:  
Gilbert, Kirss, Foster, & Davies – Atoms First General Chemistry (2011 – present)  
Birk and Yezerski – General Chemistry text (2011 – present)  
Engle and Reid – Physical Chemistry, 2<sup>nd</sup> Ed.  
Reviewer for Engle, Reid, and Heinekey – Chemistry

### **Grant Activities**

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- 2011 Schaertel, S. (Co-Principal), Henderleiter, J. (Co-Principal), Pentecost, T. C. (Co-Principal), Grant, "Vernier Equipment Grant", Vernier, Private, \$10,000.00, Not Funded.
- 2011 Pentecost, T. C. (Principal), VandenPlas, J. R. (Co-Principal), Sponsored Research, "Collaborative Research: Constructing a Community of Chemical Educators in Assessment Instrument Development", National Science Foundation, Federal, \$93,101.00, Not Funded.
- 2010 Center for Scholarly and Creative Excellence (CSCE) – Research Grant-In-Aid, "Building a Research Tool: Development and Validation of the Bonding, Structure, and Properties Assessment (BSPA)", \$2988, 3/12 – 8/13/2010
- 2010 Center for Scholarly and Creative Excellence (CSCE) – Faculty Summer Stipend, "Building a Research Tool: Development and Validation of the Bonding, Structure, and Properties Assessment (BSPA)", \$5000, 5/12 – 8/13/2010
- 2007 NSF – CCLI Phase I – Review Panel
- 2001 – 2004 Northern Colorado Community College/University Rural Teacher Preparation Initiative - NSF-ATE

1995 – 1998 Rocky Mountain Teacher Education Collaborative (RMTEC) – NSF

### **Honors and Awards**

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- 2006 Faculty Excellence Award for Teaching – Aims Community College Faculty Senate
- 1999 Catalyst Regional Award Winner for Excellence in Chemistry Teaching
- 1994/95 Tandy Corporation — Scholar in the Classroom Teaching Award
- 1994 Laboratory Enhancement Grant – Baton Rouge Chapter of the American Institute of Chemical Engineers
- 1989 Travel Award to Present Poster at the Second International Conference on Chemical Kinetics
- 1989 Outstanding Alumnus – University of Tennessee at Martin Chapter of the Student Affiliates of the American Chemical Society
- 1988 Air Force Office of Scientific Research Graduate Student Summer Research Fellowship
- 1987 Sigma Xi Undergraduate Research Award, University of Tennessee at Martin.
- 1986 Summer Science Alliance Research Fellowship, University of Tennessee at Knoxville

### **College Service (GVSU only)**

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- 2012 GVSU – Member Meijer Honors College Faculty Council
- 2011 – 2012 GVSU Chemistry Department – Discussion Task Force
- 2010 – present GVSU Chemistry Department – Assessment Committee
- 2010 – present GVSU Chemistry Department – Curriculum Committee
- 2010 – present GVSU Chemistry Department – CHM 115/116 Lab revision Committee
- 2010 – present GVSU – Pew Faculty Teaching and Learning Center – Group leader for Faculty-to-Faculty Mentor Program
- 2010 GVSU – Pew Faculty Teaching and Learning Center – Project Mentor for Liberal Education Academy
- 2010 – present GVSU Transitions Program – Academic Module
- 2010 & 2012 GVSU Honors College – Group Leader for Scholar’s Institute

2010 – present

GVSU – Regional Science Olympiad Competition – Experimental Design  
Group B (2010), Optics Group C (2011)